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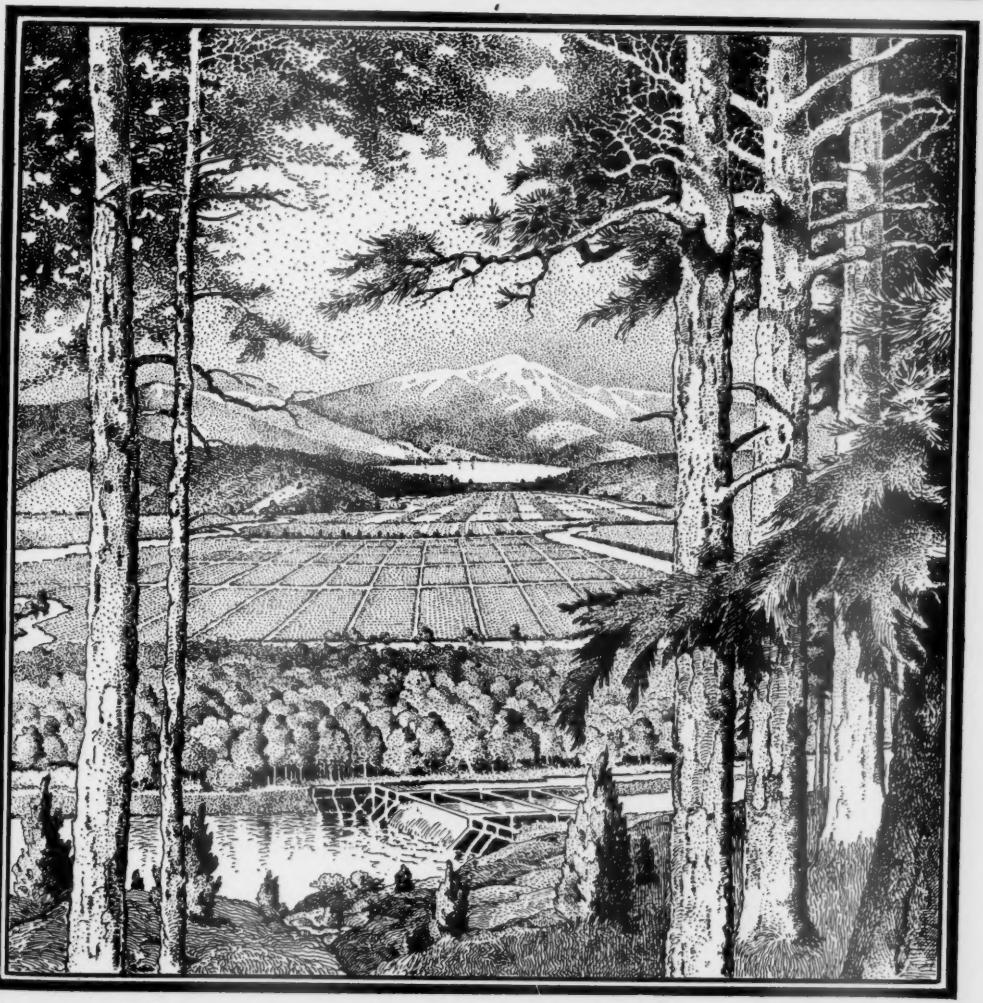
FORESTRY & IRRIGATION



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1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.

4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

Forestry and Irrigation

H. M. SUTER, Editor and Publisher

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SKIDDING RED FIR IN A WASHINGTON FOREST. THOUSANDS OF ACRES OF THIS VALUABLE TIMBER WERE DESTROYED BY FOREST FIRES DURING JUNE (P. 296).

Forestry and Irrigation.

VOL. VIII. JULY, 1902. No. 7.

NEWS AND NOTES.

Special Summer Meeting. At the invitation of the Michigan Forestry Commission and the Michigan Agricultural College, the special summer meeting of the American Forestry Association for 1902 will be held at Lansing, Michigan, on Wednesday and Thursday, August 27 and 28, to be followed by an excursion to Mackinac.

There will be three sessions on Wednesday, August 27, at 10 a. m., 2.30, and 8 p. m., and two sessions on Thursday, August 28, at 10 a. m. and 2.30 p. m. The sessions will be held at the State Capitol.

At the close of the afternoon session on August 28, a special train will be provided to convey those who desire to accompany the excursion to the Michigan Forestry Preserve in Roscommon and Crawford counties, by way of Saginaw and Bay City. From this point the excursion will proceed to the hardwood forests in Antrim county, thence to Mackinac Island.

Commencement at Cornell. At the commencement exercises of the New York State College of Forestry there were two graduates, Mr. E. A. Sterling and Mr. W. W. Clark. Mr. Sterling was the only graduate present, as Mr. Clark had been excused a few weeks earlier in order to accept a position in connection with the Forestry Bureau at Manila. Mr. Sterling has accepted a position with the New York State Forest, Fish, and Game Commission. This commencement was the first at which the degree of F. E. (Forest Engineer) has been conferred on the graduates of this college. The former graduates have also been granted the degree of F. E. in place of B. F. (Bachelor of Forestry), which was formerly conferred. During the college year just ended there were forty-four students registered at the New York State College of Forestry.

To Have Charge of Irrigation. It is now definitely known that the national irrigation policy which the recently passed Irrigation Bill provides for will be carried out by the Secretary of the Interior through the U. S. Geological Survey, as at present constituted, under the immediate supervision of Mr. Charles D. Walcott, the Director, and Mr. F. H. Newell, the chief of the Division of Hydrography.

This removes any danger of the work falling into the hands of untried men. The work of the Survey in all its relations to the development of the irrigation resources of the arid region has been eminently satisfactory to the people of the West who are familiar with what has been so far accomplished. Mr. Newell has been in charge of the work for fourteen years. He entered the employ of the Geological Survey under Major Powell, who may really be said to be the father of the national irrigation policy, and his great conception of the marvelous possibilities of the arid region under a national plan for its development seems now about to be realized. Mr. Newell has made almost a life study of the subject, and is probably more familiar than any other man in the United States with the irrigation resources of the West and what must be done to accomplish the purposes of the new national irrigation law, which has been well designated the new Homestead Law.

New Forest Officers. Mr. A. A. Anderson, of New York, owner of Palette Ranch in western Wyoming, has accepted the position of special superintendent of the Teton and Yellowstone Forest Reserves. Mr. Anderson will enter upon his duties at once, and after completing the organization of the patrol force, expects to devote the greater part of the summer to the examination of the territory with special reference to the advisability of retaining the present boundary lines.

Mr. Henry Michelsen, well known as the vice-president of the American Forestry Association for Colorado and one of the leaders in forest matters in that state, has accepted the position of supervisor for the group of forest reserves about Pike's Peak (Pike's Peak, Plum Creek, and South Platte Reserves). These are among the most important of the national forest reserves, and they have suffered a great deal from timber depredations and fire. It is encouraging to note that a man deeply interested in forest matters has been put in charge of them, and his appointment will likely result in a much needed improvement in the administration of these reserves.

Mr. J. B. Leiberg, formerly of the U. S. Geological Survey, widely known through his excellent reports on the Priest River, Bitter Root, and other forest reserves, published in the annual reports of the U. S. Geological Survey, has entered upon his duties as forest supervisor of the northern half of the Bitter Root Reserve in Idaho.

Mr. E. T. Allen, of the Bureau of Forestry, Department of Agriculture, and at present serving as inspector of forest reserves in the Department of the Interior, is engaged in an inspection of the Pike's Peak and South Platte Reserves.

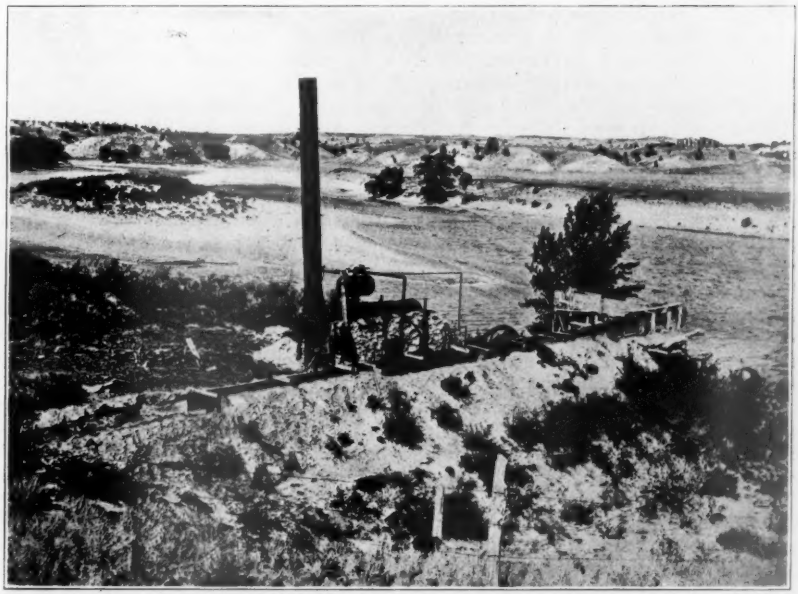
Commencement at Yale Forest School. The commencement exercises of the Yale Forest School took place on June 24 and 25. There were eight men in the graduating class.

The class day exercises were held on Tuesday, June 24, when a class tree was planted on the school grounds. Mr. Akerman spoke for the class, and Professor Toumey responded on behalf of the faculty.

The graduation exercises were held in Battell Chapel on Wednesday, June 25. This is the first time that the degree of Master of Forestry has been conferred at Yale. Following is a list of the members of the class: Alfred Akerman, Charles Sidney Chapman, Alfred Knight Chittenden, George Edwards Clements, Christopher Temple Emmet, Ralph Sheldon Hosmer, Roy Lear Marston, and George Hewitt Myers.

Mr. Chapman, Mr. Clements, and Mr. Hosmer have taken up work in the Bureau of Forestry. Mr. Akerman and Mr. Marston have been appointed instructors in the Yale Forest School, and will take up their duties in the fall. Mr. Chittenden has gone abroad to continue his studies in Europe, and Mr. Myers is studying forest conditions in the West. Mr. Emmet is engaged in studying the preservation of railroad ties under Dr. von Schrenck.

Comment on Forest Reserve Transfer Bill. The defeat of the bill to transfer the administration of the forest reserves from the Department of the Interior to the Department of Agriculture has caused much comment, for the measure had the indorsement of President Roosevelt, the Secretary of the Interior, and the Secretary of Agriculture. Representative Cannon, who was mainly responsible for the defeat of the bill, on the plea of economy, comes in for severe criticism. The *American Lumberman*, of Chicago, one of the most prominent trade journals in the country, alludes to Mr. Cannon's speech against the bill as "about as small and mean a piece of political buncombe as has ever been seen in Congress." This journal further goes on to say that "the trouble seems to be that there was apparently no positively partisan advantage to be gained in this matter, and Mr. Cannon seemed to think that he had found an opportunity to make a reputation for economy without sacrificing anything of political



IRRIGATION PLANT OF W. N. KRATER ON BANKS OF THE NORTH PLATTE RIVER, EIGHT MILES NORTHWEST OF GUERNSEY, WYOMING. CONSISTS OF TWO CENTRIFUGAL PUMPS WITH A CAPACITY OF 3,000 GALLONS A MINUTE, LIFT OF 20 FEET. ONE HUNDRED ACRES UNDER DITCH, AND THE OWNERS REGARD THE EXPERIMENT A SUCCESS.

pull. He will find out eventually that he has made one of the greatest mistakes of his public career."

A number of other papers comment in the same vein, and general regret is expressed at the defeat of a bill which was considered "a strictly non-political one, and which was in the interest of the public."

Bureau of Forestry Field Work.

On July 1st the Bureau of Forestry began its field season of 1902, and its work is now being carried on in twenty states. The Bureau has appointed 90 new student assistants for this season, the entire field force numbering 165 men. The work includes, among other things, the gathering of the necessary data for several working plans, a study of a number of well-known commercial trees, the examination of farm woodlots, and a study of the treeless areas with a view of devising plans for forest extension.

The Bureau of Forestry begins the new fiscal year of 1902–1903 with an appropriation of $291,860; the amount for the year just ended was $185,440. This increased appropriation shows how this work commends itself to Congress, and it makes possible a much wider range of work. The present season's work is by far the most varied and interesting yet undertaken by the Bureau of Forestry, and is being carried on in Maine, New Hampshire, Vermont, Massachusetts, New York, New Jersey, Maryland, Tennessee, Kentucky, West Virginia, North Carolina, Michigan, Minnesota, Nebraska, Oklahoma, South Dakota, Montana, Arizona, and California. Later in the season it will be extended to still other states and territories.

The field work necessary for a working plan for the tract of the Great

Northern Paper Company, which was begun last field season, is being continued now, and will be finished this year. It is being carried on by two fully equipped parties, each consisting of 15 men. A working plan is being made for the tract of hardwoods of the Linville Improvement Company, lying around Grandfather Mountain, in western North Carolina. The Bureau is also making a careful study of the forest resources of Otsego county, New York, with the purpose of drawing up a simple and direct manual of instructions for the management of the private forest lands in that county. The expenses of the field work are being borne wholly by Mrs. Alfred Corning Clark, who is greatly interested in forestry and desirous that the forests of the county shall be treated in a practical manner.

Through the coöperation of Mr. Ring, Forest Commissioner of Maine, a study has been undertaken of the forest conditions of that state. This is to include an investigation of the behavior of the spruce after lumbering, in order to draw up simple and practical rules for hastening the production of a second crop upon lumbered areas. It entails also a careful study of the fire problem and of the best means of fighting fire in this region. This investigation further includes a consideration of local log scales.

Much attention will be given during the present season to the examination of woodlots, in the management of which the assistance of the Bureau has been requested. Two skilled men will be detailed for this work, and it is the intention of the Bureau that its agents shall visit all woodlots for which applications have been made.

One of the most important and interesting undertakings by the Bureau of Forestry during the present field season is a careful study of a number of the most valuable American commercial trees. This will include, among others, a study of the Adirondack Balsam, in Franklin county, New York. Incident to the work of the Bureau in connection with the Chippewa Indian Reservation in Minnesota, a careful study of the Red Pine is in progress.

The study of the rate of growth of the Sugar Pine in California, which was begun last season, is being continued. Last year's work began in the northern part of the state and in southern Oregon, and this season the examination will be continued southward with the idea of covering the full commercial range of this important timber tree.

The southern hardwoods will be studied in Kentucky, North Carolina, and West Virginia. This work will be mainly devoted to a consideration of the oaks and the Yellow Poplar, the idea being to study them in their commercial ranges, along with other trees which occur in mixture with them.

The work by the Bureau of Forestry during the present field season will also include an investigation of the distribution of forests, their character, extent, and the available supplies of timber.

The study of the forest resources of the best timbered counties of Maryland is being continued ; this work was begun in 1900, and has been going on through each field season since. Examinations of the forest conditions and resources of Vermont, and also of portions of the northern peninsula of Michigan, are being made.

Investigations have begun in the collection of published and unpublished data showing the past and present yields of wood of various kinds, including imports and exports, and consumption for all purposes. This investigation also includes a consideration of American woods in foreign markets and foreign woods in home markets. Attention is being given to the collection of data showing the production and value of by-products of American forests. This will include commercial gums, resins, turpentine, and tan extracts.

Forest Extension. On July 1st the Division of Forest Extension was established in the Bureau of Forestry, to take charge of the work heretofore done by the Section of Tree Planting. The work of the new division will be to devise plans for increasing the forest area where it is deficient. This it will do by the encouragement of planting where that is

necessary to secure a stand of trees, and by improving the conditions for natural seeding over areas where the present forest stand is insufficient.

Several parties are now in the field in connection with this work. In the Middle West a large number of landowners have made application for assistance in establishing woodlot and other forest plantations, and the work of examining these farms and preparing plans for them is now under way.

On the forest reserves recently established in the sand-hills of Nebraska by President Roosevelt's proclamation preparations for extensive planting are being carried forward as rapidly as possible. The necessary buildings will be erected, seed beds and nurseries will be prepared, and a large quantity of seed collected in preparation for planting next spring.

A field party of seven men is making a forest survey of Oklahoma, including a special study of forest conditions on the Wichita Forest Reserve. On the Prescott Forest Reserve, in Arizona, an investigation is being made to devise methods for increasing the forest stand by improving the conditions for natural seeding.

In Massachusetts and New Hampshire a party is studying the reproduction of White Pine, on old fields and pastures, for the purpose of determining the best conditions for seed germination. In addition, a party will study the results of planting to reclaim the sand-dunes along the Atlantic Coast. A great deal of work has been done for this purpose on Cape Cod, in Massachusetts, and some in New Jersey. A thorough study is also being made of the drifting sand along the Columbia River, in the vicinity of The Dalles, Oregon, to devise means for controlling it by planting.

In Cornell's Favor. Attorney General Davies has decided that the New York State College of Forestry has not violated any provisions of law on the land held by it in the Adirondack Preserve, and he has made public an opinion in which he holds that there exists no cause for the commencement of an action to dispossess from lands which the college holds for forest purposes.

In his opinion Attorney General Davies says:

"This contention rests entirely upon the assumption that the lands in question are 'the lands of the state,' and this assumption is wholly unwarranted. The lands are the property of Cornell University. The act in pursuance of which they were purchased provides that 'the university shall have the title, possession, management, and control of such land,' for a period of thirty years.

"The argument that the state is the equitable owner rests, of course, wholly upon the theory that the moneys of the state were unlawfully employed in their purchase.

"This is not the fact. The doctrine of equitable ownership and resulting trusts has no application. Any corporation or individual owning lands within the forest preserve may cut and destroy the timber upon it at will. It is only the lands of the state which are protected."

New Forest Association. A state forest association was recently organized at Cheyenne, Wyoming, with the following officers: H. B. Henderson, president; W. H. Holliday, vice-president; W. C. Deming, secretary; F. Chatterton, treasurer. The association recommended that a superintendent of forestry be appointed for each county in the state. A resolution was also passed asking the trustees of the University of Wyoming to consider at their next meeting the advisability of establishing a department of forestry in that institution.

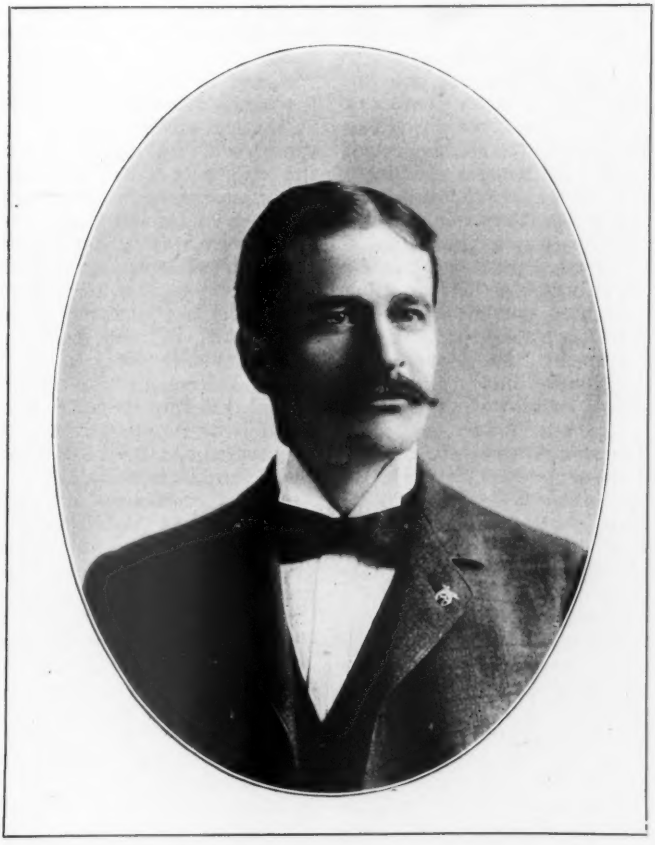
Southern Forest Reserve. On June 24 the Senate passed a bill for the purchase of 4,000,000 acres of land in the southern Appalachian Mountains for the creation of a national forest reserve. The bill provides that the cost shall not exceed $10,000,000, and that the Secretary of Agriculture is to designate the lands to be purchased and take measures to preserve the forests.

There was not time for this bill to be

considered by the House before adjournment, and it therefore goes over as unfinished business until next session, when it will again be taken up.

A Minnesota Forest Reserve. A bill was passed by Congress during the last week of the recent session which provides for the sale of the pine timber upon the ceded Chippawa reservations in northern Minnesota; the bill also contains a provision for establishing a national forest reserve on a portion of these lands.

The section which relates to the establishment of a forest reserve provides, that in the cutting of the timber on 200,000 acres of the pine lands, to be selected by the Forester of the Department of Agriculture, with the approval of the Secretary of the Interior, the purchaser shall be required to leave standing five per cent of the pine timber thereon for the purpose of reforestation. As soon as the merchantable pine timber is removed, these lands are to become a part of a forest reserve as though set apart by the proclamation of the President.



HON. FRANK W. MONDELL.

HON. FRANK W. MONDELL, the leader of the House of Representatives in the passage of the recent Irrigation Bill, was born in St. Louis, Missouri, November 6, 1860. He received his early education in St. Louis, later in Iowa, and moved to Wyoming in 1887. He was mayor of Newcastle, Wyoming, from 1890 to 1895 and a member of the first state legislature. He became president of the senate for the second legislature, and served in Congress from 1895 to 1897. He was then Assistant Commissioner of the General Land Office, and returned to Congress in 1899.

Mr. Mondell has always been an earnest advocate of irrigation, and from his experience in the Land Office, as well as in the arid west, has become convinced of the necessity of carrying out certain important reforms of the land laws. His energetic championship of the Irrigation Bill and the striking success of this measure when brought before the House testify to his deep interest in the subject.

COMMENT ON THE IRRIGATION BILL.

THE passage of the Irrigation Bill occurred as the June number of FORESTRY AND IRRIGATION was going to press, and simply the announcement of its passage and the text of the bill were printed. Since then there has been time to consider the causes that brought about the final passage of the bill, and the manner in which the general public views the subject of national irrigation.

One of the most notable features of the session of Congress just closed was the really remarkable development of the whole irrigation movement. Certainly no more striking change in the status of a legislative matter took place during this session than that which came over the attitude of Congress toward the Irrigation Bill. Early in the session it was evident that a national irrigation bill would pass the Senate. It was equally apparent at that time that a large majority in the House was against the passage of such a bill.

After the Senate had passed its irrigation bill it was still evident that a majority of the House was against any such measure, and, what was more significant, the Senate bill contained a number of features which were objectionable to President Roosevelt and to the National Irrigation Association. The President and others, who desired an irrigation bill which should be a home-making bill, immediately instituted a vigorous campaign to secure such amendments as would eliminate from the Senate measure its objectionable features. The western members of Congress were practically united to secure this result. Many conferences were held, both at the Capitol and at the White House, and a personal canvass was conducted by the advocates of a proper measure, not only to secure amendments for the Senate bill, but to secure the passage of the measure through the House.

The House Committee on Irrigation decided to abandon its own measure for the purpose of gaining time, and adopted the Senate bill, making the necessary amendments thereto to secure the support of the administration and of the National Irrigation Association. Earlier predictions to the effect that no irrigation legislation could be enacted at this session of Congress were based entirely upon lack of knowledge of the importance of the measure among many members of Congress and the lack of support from President Roosevelt and the National Irrigation Association for any bill such as the Senate measure, which did not conform to the fundamental idea of home-building on the public lands.

The House committee reported the amended Senate measure April 7, and this bill as reported received the full approval of the President and the National Irrigation Association.

From this time on up to the day on which the final vote in the House was taken the amended bill gained supporters. The opposition to the bill was confined mainly to members from the farming communities of the East, and the main argument advanced was that the reclamation of the arid lands would bring about injurious competition to the farmers of the East. As the scope and purpose of the bill were made plain to them, that only the funds from the sale of the public lands in the arid states was to be used; that the amount of land that could be reclaimed was too small to depreciate farm values in the East; but that, on the other hand, the development of the West would create new markets for eastern manufacturers, and thus inure to the benefit of the eastern farmer, this opposition in a great measure was overcome.

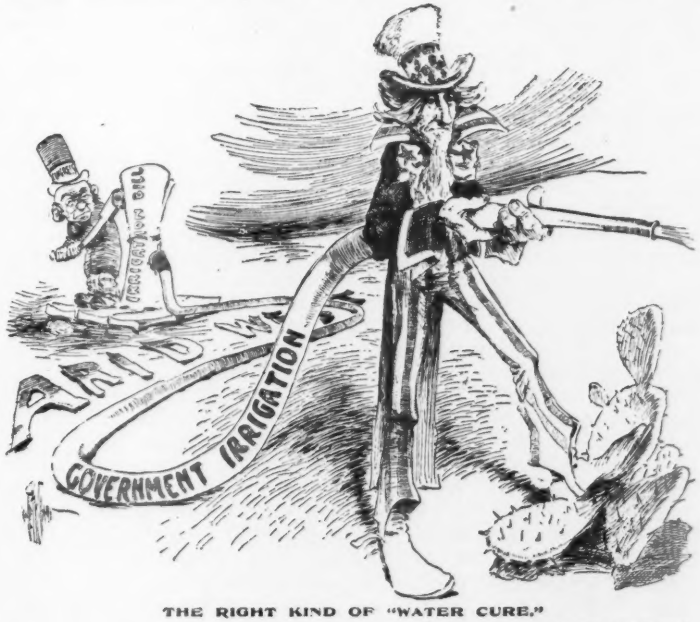
Too much credit cannot be given President Roosevelt for his part in the passage of the Irrigation Bill. To his firm stand for irrigation legislation at this session the passage of the bill is undoubtedly due. His objections to certain features in the Senate bill brought about the improvement of the measure, until as finally passed it is such a bill as the champions for a home-building measure have contended for. President Roosevelt has a more intimate knowledge of the West and its needs

than any former President. His long residence there gave him an unusual opportunity to study its resources, and to his practical suggestions and firm stand the West owes the passage of a law that will be far-reaching in its good effects. It is not too much to say that without President Roosevelt's aid the reclamation of the arid lands would have been postponed indefinitely.

In speaking of the causes that led to the passage of the Irrigation Bill great praise must be given to the National Irrigation Association for its steady and effective support. For years this organization has been carrying on an educational campaign for the purpose of awakening interest in the work of reclaiming the arid lands. In advocating this work the National Irrigation Association has steadily maintained that the public lands must be reserved for home-builders; that reservoirs should be built and water provided for the lands; that the public lands be reserved for actual settlers under the Homestead Act, and that they be allotted in small areas, and so kept out of the hands of speculators. The National Irrigation Association has convinced the manufacturers of the East that a great market awaits them in the development of the West; it has brought about a general understanding that the development of the West is a national question. It has been through the leadership of the National Irrigation Association that the various forces working for the reclamation of the arid lands have been united.

In calling attention to the work of the National Irrigation Association it is but just that mention be made of the splendid work done for the cause of national irrigation by Mr. George H. Maxwell, its executive chairman. Mr. Maxwell has been for years a most potent factor in bringing the subject of national irrigation to the attention of thinking people throughout the country. His sincere, convincing arguments were of great assistance in shaping and bringing to a successful issue the recently passed bill. To his untiring efforts and executive ability is due, in a great measure, the effectiveness of the National Irrigation Association.

The rapid progress of the Irrigation Bill in the House and the substantial



THE RIGHT KIND OF "WATER CURE."

From the Boston *Herald*.

majority by which it finally passed reflects great credit on those members who were in charge of it. Mr. Mondell, of Wyoming, who was leader of the forces on the floor of the House, and Mr, Reeder, of Kansas, for effective work in committee, deserve special credit. Representative Francis G. Newlands, of Nevada, who has long been working for the passage of such a measure, again did effective work. Representative Tongue, of Oregon, as chairman of the committee, and Representative Sutherland, of Utah, were also prominently identified with the bill.

During the month that has intervened since the passage of the Irrigation Bill there has been an opportunity to learn the opinion of the country at large, as expressed by the press.

Naturally the papers of the West are practically unanimous in expressing their approval of the action of Congress. In the East, where the only real opposition to the bill was manifested, it is noticeable that a number of the most influential papers speak in very favorable terms of the bill. The attitude of the eastern press, just as in the cases of many members of Congress from the same section, has experienced a very noticeable change as the purposes and scope of national irrigation have become more fully understood.

The Boston *Herald's* approval of the Irrigation Bill is testified to in the accompanying cartoon, which is reprinted from its pages. The *Scientific American* speaks of it as "one of the best measures that has become a law in the beginning of this twentieth century." The New York *Commercial* considers it "President Roosevelt's triumph," while *The Times* of the same city says: "The country is to be congratulated," and speaks of the opposition to the irrigation law on the ground that it will develop hurtful competition against eastern farmers as the "cry of all who are afraid of a fair field and of progress." The New York *Commercial Advertiser*, the Syracuse *Post-Standard*, *The Press* and *The Inquirer* of Philadelphia approve of the bill's passage.

Among the Chicago papers the *Inter-Ocean* says: "The Irrigation Bill is likely to pass into history as the wisest legislation of the present Congress." The *Record-Herald* comments as follows: "It would be difficult to conceive of a more practicable and economical scheme for extending government aid to irrigation than the plan embodied in this measure." The *Journal* believes "the bill is a wise one, and will meet with the approval of the people everywhere." The Jackson, Mich., *Patriot* says that "nothing Congress has done at its present session is of greater importance than the passage of the Irrigation Bill." The Cincinnati, *Commercial-Tribune* points to the passage of the Irrigation Bill "as strong evidence that broader views are being entertained, and that even Congressmen are beginning to understand that what enures to the benefit of one section enures to the benefit of all." The Louisville, Ky., *Commercial* says: "Every intelligent business man will approve of this great work, which was proposed by President Roosevelt in his first message to Congress." The Birmingham, Ala., *Age-Herald* speaks of the Irrigation Bill "as a very important and far-reaching law," while the Duluth, Minn., *News-Tribune* says: "It is gratifying to know that so great and necessary a work is to be begun at last."

The passage of the Irrigation Bill is bound to arouse interest in forestry throughout the West. To reclaim the arid lands by means of irrigation depends in a great measure upon the protection of the forests along the headwaters of the streams. They serve to break the force of the rain and regulate the run-off, and thus minimize the damage to reservoirs from silt. About the headwaters of many streams, the waters of which will now be utilized, the government has established forest reserves, whose importance in the irrigation movement cannot be easily overestimated. The success of a number of important irrigation projects will depend on the administration of the forest reserves. With the beginning of national irrigation these reserves assume a new and greater importance, and it is imperative that they receive the best technical administration obtainable. In the reclamation of the arid region forestry and irrigation must go hand in hand.

ADMINISTRATION OF THE U. S. FOREST RESERVES.

By Filibert Roth,
Chief of Division R, General Land Office.

PART III.—BUSINESS AFFAIRS.

THE work done by the field force in the U. S. Forest Reserves may be divided into protective or patrol duty, timber-work, and miscellaneous duties, principally in connection with the control of grazing, the examinations of land claims, and applications for privileges, such as rights of way for railways, wagon roads, canals, etc.

Generally the patrol duty is still the most important, and probably 75 per cent of all the work belongs under this head.

As might be expected, the protective work is directed chiefly against fire and timber depredation or trespass. That this work has borne fruit is fully demonstrated and quite generally acknowledged. Hundreds of small fires, which might in many cases have developed into destructive forest fires, have been extinguished in their beginning. Similarly, a strict patrol, together with an orderly system of disposing of timber, has reduced timber depredations to a marked degree. In certain mining districts only a few years ago the mining concerns largely supplied themselves with fuel and timber by operating under the mischievous law of 1878, which allows indiscriminate cutting on mineral lands. At the same time, trespass cases, ranging in amount from a few hundred to many thousands of dollars, were matters of course and were met on every hand. In these same districts all demands are now supplied in a regular way. The timber is purchased, and its removal is carried on according to definite rules and plans. The claim that a small band of a few hundred men, scattered over such large areas, can accomplish little or no good has proven entirely false, and there are thousands of people ready to testify to the fact that the expenditure of public funds on the reserve patrol has been a most successful investment.

During the first years of reserve administration this work was naturally of an experimental nature. Generally each ranger was assigned to a particular beat or district (usually many miles in extent) and was left without further surveillance than the supervisor of the reserve could accomplish. In the smaller reserves and in districts where roads and trails were abundant, this plan worked fairly well; but in the large reserves, where means of communication were scant and poor and where rangers, on this account, were sometimes all the summer without the advice and assistance of their superior, it was seriously defective. Even faithful men require encouragement and a certain amount of recognition. For this reason the system has been altered in the manner alluded to before.

It is now expected that the force on the reserves will be organized on the following order: suppose, on a given reserve, there are to be assigned during the summer season 12 rangers of class III, 4 of class II, and 1 of class I; the reserve will then be divided into 12 ordinary beats. Each of the 4 men of class II will be given charge of three such beats or men. Each of these will perform ranger duty like the others, but at the same time look after the men of class III. They will be required to ride with them and see that they cover their territory in the best manner. They will also advise and instruct them and in cases of importance accompany and assist them. The ranger of class I, in turn, will go from district to district, look after the more important cases, especially matters of timber-cutting, etc., and thus represent the supervisor whenever and wherever this officer cannot

appear in person. It is hoped in this manner to establish a closer organization and a better spirit, and at the same time prevent carelessness. While this system requires that a better salary be paid to the men of classes I and II, it is believed to be a fact, well sustained by the experience of similar patrol and protective bodies, that 10 men well organized are worth more than 15 men without proper organization.

So far, the rangers have not been uniformed and merely carry a badge; but in the San Gabriel and Pine Mountain and Zaca Lake reserves in California the rangers patrol in uniforms. This has resulted in much advantage to these ranger bodies, which, under the active leadership of Supervisors Thomas and Slosson, have earned for themselves general esteem and recognition.

The timber-work, or work in forestry, has been limited so far to supplying urgent applications, cases where the timber was needed in or near the reserve, the miners and farmers being the principal consumers. While thus far this branch of the work has been rather secondary, it follows from the very nature and object of these reserves, as well as from the experience of the first few years of their administration, that the timber-work will soon be foremost, and that in nearly every reserve the ranger will have to become something of an estimator, scaler, and general timber surveyor.

Even now there is great need of a thorough study and description of many of the forests of these reserves; for only a careful detail survey of this kind will make it possible to dispose of the ripe material in a judicious manner, and guard against overcutting and other serious mistakes.

In disposing of timber the protection of the forest has ever been the guiding principle. Timber is never sold simply because some one is willing to take it if ample concessions are made. On the contrary, timber is sold only after the local officer's report shows that the timber may well be spared; that there is a real, urgent demand for the same. Preferably it is sold only if its removal is likely to bring about an improvement of the forest by replacing an old open or broken forest by a denser young growth, which better subserves the purposes of a protective forest.

In distributing the cutting over the reserves, it is the intention always to adhere strictly to the forester's first principle—never to cut more than is growing. In applying this rule, any given reserve is considered in relation to its surroundings, and an effort is made to avoid overcutting, not only for the entire reserve, but also for any particular natural district, watershed, etc.

So far the amount of material disposed of has been small in nearly all reserves, compared with the amount which the forest is capable of supplying. Moreover, every effort has been made to induce consumers, as far as possible, to satisfy their demands from injured and dead material. In most reserves, and especially in the Rocky Mountain region, this exists in large quantities, since the fire-damaged trees season on the stump and commonly remain serviceable for years.

During the year 1900–1901 there were sold, in round numbers, about 26,000,000 feet of timber and 21,000 cords of wood, or, expressed in cords, about 73,000 cords, all told. There were given away, under the free-use system, about 20,000 cords, of which fully three-fourths was cord-wood and fencing, and nearly all cut from dead material. While the cut for the past fiscal year is very much greater, it is still a mere trifle in most reserves. In a few, however, this is not the case, and a small supply, together with the great danger of permanent denudation, owing to difficult and slow reproduction, have made it necessary to restrict and discourage timber sales.

Timber in forest reserves is disposed of in two ways—either by sale or by what is known as the free-use system, where the material is given gratis to settlers, prospectors, and others. This latter method is an outgrowth of the liberal homestead idea, and is treated strictly as a privilege to be granted only to those who appear entitled and worthy. Since it is primarily a method of supplying settlers, and involves in nearly all cases only small quantities, mostly of

dead timber for fuel, fencing, house-logs, etc., it has been found very desirable to make the system as simple and expeditious as possible. To this end the superintendent formerly granted all applications of this kind, and of late this authority has been transferred to the supervisor, or actual manager of the reserve. At the same time, however, the maximum amount granted by the local officer has been reduced from $100 to $20 stumpage value.

In cases of sale a formal application, accompanied by a detail report involving a forest description and estimate of the timber desired by the applicant, is submitted to the Secretary of the Interior, who grants or refuses the sale. If granted, the timber is usually offered for sale by regular advertisement. The successful bidder is then required to enter into a contract, sometimes accompanied by a bond, pays in advance, and conducts his work in accordance with the printed and written contract, under the supervision of a ranger or other forest officer.

In all cases the area from which the timber is to be removed is limited by a blazed line; all trees, in live timber, are marked for cutting. There is usually a size-limit, modified to meet conditions; the height of the stump, an economical use of the trunk, and, in many cases, the use of all of the wood above three inches in thickness, is prescribed and insisted upon. In most cases thus far allowed, the tops are worked up into cord-wood, and the limbs are piled ready for burning. so that many of the cuttings on the reserves have been done in a manner creditable to any forest management. The logs, cord-wood, etc., are measured and stamped before removal, just as in similar operations elsewhere.

So far, then. the forest work in the reserves has been little more than a modification of ordinary lumbering, restricted to local, urgent demands. It has been limited to such timber as could be spared without injury to the protective forest, and at the same time secure an economic use of the material; also a cleaning up of débris, such as any orderly farmer demands in his wood-lot, thus avoiding the dangerous fire-traps of the ordinary logger's "slash." In addition, a few attempts have been made in other directions. In some of the reserves fire lines have been cut for the protection of the timber, and also a few preliminary experiments have been made of reforestation of burns and chaparral lands. So far, the results of these experiments are too few to warrant further description. To what extent reforestation of bare lands and similar work in practical forestry will be introduced is difficult to state now. That there are a number of localities where a reasonable expenditure of money for this purpose would be well repaid, there is not the least doubt, but with present appropriations matters of this kind must remain among the *desiderata*.

Grazing in the forest reserves to-day is of greater importance, financially, to the people of the respective districts than is the timber business.

Generally, sheep and goats are forbidden to graze on reserves. This is in accord with the general belief and experience that close-herded bands of any kind of animals are more destructive than scattered loose-footed grazing animals. Owing to peculiar local conditions, sheep-grazing is permitted at present in eight of the forty-six reserves now in existence. A limited number of cattle and horses are permitted to graze in nearly all reserves. During the season of 1901 the total number of animals grazed on reserve pastures amounted in round numbers to 1,180,000 head of sheep and 277,000 head of cattle and horses.

Under the present rules the grazing in all reserves and of all kinds of stock is controlled by a permit system, which makes it necessary for every one to make formal application. For the accommodation of actual settlers within forest reserves owning small herds, the matter is simplified by having the supervisor issue the permits.

In all cases the total number of animals allowed to graze in any given reserve is decided for each year by the Department of the Interior, and also the time when stock may enter the reserve, as well as the length of the grazing season. In all reserves where sheep are

allowed, they are restricted to certain parts of the reserves, to protect areas specially subject to erosion or otherwise likely to be damaged, and also to avoid conflict between cattle and sheep, which, as is well known, do not thrive together.

Aside from the work incidental to this permit system, these grazing privileges involve considerable effort and time on the part of the field force in seeing to a proper distribution of stock, and preventing trespass by men without permits or by flocks on closed areas.

The miscellaneous work in connection with the examination of land and mining claims, rights of way of roads, railways, canals, etc., and also in connection with applications for the privilege of building and running saw-mills, hotels, etc., can only be alluded to in this outline.

THE RED CEDAR IN NEBRASKA.

By Louis C. Miller,

Bureau of Forestry.

In May, 1901, a party was sent to Nebraska by the Bureau of Forestry to investigate the condition of natural and planted timber in that state. In making this investigation the Platte River was followed from its mouth to the Wyoming line. The party then turned north to the Pine Ridge district, then southeast, through the sand-hill region, to the Middle Loup River. Particular attention was paid to the two most valuable timber trees—the Red Cedar and the Rock Pine. It is the purpose of this article to give a few facts gained from the investigation of the Red Cedar.

The quantity of cedar timber produced in Nebraska has never been great, but in certain localities it has been a boon to the pioneer, in that it furnished material for fencing and other important purposes.

The quantity of Red Cedar in the Platte River region fell short of expectations. The growth in most places is small and scattering, and on islands on which it was reported as growing it is not to be found. This is explained in this way: all the seed trees have been cut for posts, and the young seedlings have been removed for door-yard planting.

Nearly every county investigated has a scattering growth of Red Cedar, but it is found in greatest abundance on Lee Island, in the Platte River, near Fremont. This island has an area of about 50 acres and contains a mixed growth of Red Cedar, Cottonwood, White Elm, and Green Ash. Taking the island as a whole, the Red Cedar is the predominant species, the Cottonwood ranking next. Conditions are extremely favorable for tree growth, and, as the owner has protected this growth from fire and stock, the indications are that he will soon have a crop of valuable timber.

A scattering growth of Red Cedar is found along the bluffs of Cedar Creek, in the vicinity of Fullerton, Nance County. There is also a fine growth on an island in the Platte River near Central City, Merrick County. From Central City to Kearney the cedar is rare, and is not common again until the loess bluffs south and west of Gothenburg are reached. Here it is found only as scattering specimens, often growing on the bare, steep bluffs at a height of 200 feet from the base. That trees of fair size once grew in that locality is evident from the great number of stumps that are found. When the Union Pacific Railroad was being constructed through the Platte River Valley, every canyon was literally stripped of Red Cedar, as well as of all other timber. As a result of this, the only growth that remains is scattering and of little value.

In the bluff regions of the North Platte, in the vicinity of Ogallala, the Red Cedar is found growing on very steep and rocky slopes. No large speci-

REPRODUCTION OF RED CEDAR ON LEE ISLAND, FREMONT, NEBRASKA. SEED-TREE IN THE FOREGROUND.

mens are found for the same reason given in other regions: they have been cut for posts and other purposes. In the course of time a limited supply of valuable post timber can again be cut from these areas.

In Scotts Bluff and Banner Counties some of the best growth is found in moist places in the canyons. There is also fair growth in more exposed areas. The reason for the better growth in the canyons is due, perhaps, to the protection given by the cliffs. Some very large specimens originally grew in this region; the largest now standing is five feet in diameter and 40 feet in height.

The Red Cedar is not abundant in the Pine Ridge region. For two hundred miles along the Niobrara River, in the northern part of the state, only scattering and isolated specimens are found. Some of the nearby canyons contain much young growth, and in many places the bluffs are dotted with cedar stumps, showing that formerly there was a dense growth of this species here. During the early days large quantities of telegraph poles, ties, and posts were cut along this river and shipped to various points in the state. So completely has the cedar been removed, that were it not for the remaining stumps, one could scarcely believe that there had been, originally, a dense growth of timber anywhere along this stream.

Less than thirty years ago the canyons east of Anselmo were filled with a magnificent growth of Red Cedar. Many scrubby specimens still remain in this region, but only one gives us any knowledge of the character of the timber that once grew here. This is a lone tree, 60 feet high and 18 inches in diameter. Telegraph poles, posts, etc., have been hauled from this locality a distance of 35 to 40 miles. Many other instances might be given setting forth the original condition of the Red Cedar in Nebraska, but those mentioned above will suffice to give a somewhat general idea of the primitive supply of this valuable timber.

Owing to the present scarcity of Red Cedar in most localities, it is rather difficult to thoroughly test the rate of diameter and height growth of the older class of trees. The better growth is on private land, and it is seldom that permission can be obtained to cut for analy-

sis. However, considerable data on diameter increment was secured by means of "Pressler's accretion borer," and in this manner recent diameter growth can be approximately determined.

Two Red Cedars on Lee Island, Fremont, Nebraska, were examined to learn the rate of height and diameter growth. These trees grew where the water level is not greater than 2 feet, where the subsoil is sand, and the surface soil is an alluvial deposit from 6 to 8 inches in depth. The conditions for growth were good, and these trees were cut from a pure stand of Red Cedar.

An examination was also made of two trees on an island at Central City, Nebraska. These were intermingled with a dense growth of Green Ash, White Elm, and Hackberry, besides a number of shrubs, such as Prickly Ash and Dogwood. The soil formation is similar to that of Lee Island at Fremont, and the water table is two to six feet below the surface. The conditions for growth are fair. The average height of the four trees analyzed was 28.4 feet; the average diameter, 6.9 inches; the average annual height growth, .77 of a foot; and the average annual diameter growth, .22 of an inch.

Several trees were also examined on the river bluffs in the locality of Lee Island, and it was found that they, too, showed an annual diameter growth of .22 of an inch. Situation, in this case at least, made no difference.

The following figures show the rate of diameter growth of the Red Cedar in two widely separated regions, both presenting strikingly different soil formations:

No. of trees.	Locality.	Diameter, breast high.	Height.	Annual diameter increase.
		Inches.	*Feet.*	*Inches.*
10	Dismal River, Hooker Co..	6.96	24.1	.20
20	Scotts Bluff Co.....	14.2	37.5	.13
	Average.....	10.5	30.8	.16

The above data is interesting from the fact that the measurements made in the sand-hills of the Dismal River region show a decided increase in diameter growth over that of the same species in the Scotts Bluff region, the latter being commonly considered more favorable to the growth of Red Cedar.

The diameter growth, as well as the height growth of the Red Cedar of Nebraska, compares favorably with that of northern Alabama, as noted in a recent bulletin* published by the Bureau of Forestry. The average annual height growth for Alabama is 1 foot for the first 37 years, that of Nebraska being .77 of a foot. The average annual diameter growth for Alabama is .15 of an inch; that of Nebraska .21 of an inch. These figures show a difference in average height growth of .23 of a foot in favor of Alabama, while on the other hand they show a difference in diameter growth of .06 of an inch in favor of Nebraska.

When the favorable conditions for tree growth in northern Alabama are contrasted with the unfavorable conditions of western Nebraska, it is encouraging to the tree planter to consider the above figures.

The reproduction of Red Cedar in Nebraska is good. In no locality where seed trees occur is reproduction lacking. Where seed trees are scarce, naturally reproduction is limited. In many places the growth is sufficiently dense to create in course of time true forest conditions; but, on the other hand, there are many areas where only a tree is growing here and there along the bluffs, and in such places forest conditions will be absent for years to come. If these scattering specimens are permitted to develop into seed trees, the surrounding areas will eventually be seeded and a substantial stand of trees will be produced.

The best reproduction in the state is on Lee Island, at Fremont. Here, as has been mentioned before, the conditions for tree growth are excellent. Recent reproduction is very noticeable, and seedlings one-half to one inch high are seen in great abundance. In the shade of some tree or shrub of moderately dense foliage young red cedar seedlings

* Notes on the Red Cedar by Dr. Chas. Mohr. Bulletin 31, Bureau of Forestry, U. S. Department of Agriculture.

are numerous. Near the bases of cottonwood trees great quantities of seed germinate. Seed trees are abundant, and the sandy condition of the soil makes a most favorable seed bed for the germination of the seed. In counting the stand of seedlings, such remarkable figures as these were obtained: on an area of 20 square feet, sixty seedlings were counted, these ranging in height from 3½ inches to 3½ feet. This is an unusually large number when we come to consider that on an acre with such a stand there would be 120,000 trees. Counts of seedlings in other localities in the state show the following results:

Locality.	*Stand per acre.*
Dismal River, Thomas County.....	10,800
Middle Loup River, Hooker County..	2,638
Middle Loup River, Thomas County..	280
Middle Loup River, Cherry County...	525
Platte River, Deuel County.....	10,026
Cedar Canyon, Scotts Bluff County ..	9,695
Average.....	5,660

The above is only a small part of the data obtained during this investigation, but it is sufficient to give a good general idea of the conditions of reproduction in the state.

Considering the wide distribution, the annual height and diameter growths, and the excellent reproduction of the Red Cedar in Nebraska, it is safe to assume that as soon as it is demonstrated that plantations of this valuable timber tree can be successfully established, corporations such as railroads, and even private parties, will be induced to establish extensive plantations. The planting of Red Cedar on a large scale has not yet been undertaken in Nebraska; but wherever this tree has been planted invariably excellent results have been secured. Owing to the adaptability of Red Cedar to varied soils, its great value for fence posts, telegraph, telephone, and electric-light poles, and railroad ties, it is destined to be widely used for future planting throughout the state.

RED CEDAR GROWING ON A STEEP, ROCKY SLOPE IN THE VICINITY OF OGALLALA, NEBRASKA.

FORESTRY IN NEW JERSEY.

By a Jerseyman.

FOR many years, beginning mainly with Professor Cook, of the Geological Survey, there has been considerable agitation for reform in the treatment of the forest lands of New Jersey. Now and then the legislature has made small appropriations for the purpose of examining the forest resources of the state; investigations of various kinds have been conducted, forest areas surveyed, water questions studied, and now and then vain efforts exerted for the prevention and extinguishment of forest fires. There was at one time a state forestry association with a substantial membership, but it died a natural death, owing to a lack of support. In short, very little has been accomplished toward establishing a permanent, properly organized system of state fire protection and state purchase, or control, of those areas which should be kept in forest for protective purposes.

One difficulty has been that what little has been done in the line of forestry has emanated from, or been controlled by the State Geological Survey. Although the Survey has always been characterized by its conservatism, it has done as well as possible under the circumstances the duties imposed upon it by the legislature. This work in forestry was placed in the hands of the Survey mainly because in the beginning it was the best organization, if not the only one, to which such a task could be assigned; also because Prof. J. C. Smock, the former state geologist, was especially interested in the subject and was for several years the director and leader of the work.

The time has come, however, for forestry in New Jersey to stand wholly on its own merits and no longer be merely incidental to something else. The establishment of a chair of forestry in the State Agricultural College would have been a much better plan, for the relation of forestry to agriculture is much closer than that of forestry to geology. What is most needed is the establishment of an independent bureau of forestry, with a regular appropriation and a practical forester at its head. There has been enough of the old-time propagandist work, and the season is at hand for the accomplishment of something tangible. The whole matter has been threshed over many times already, but New Jersey has been little more than playing with the subject. Now and then a bulletin on forestry is issued; in the legislature a bill is proposed looking to the control of forest fires; papers are read at the meetings of the women's clubs and societies of various kinds, and from time to time the newspapers announce the great things in the line of forestry which are about to happen, but from all these various efforts very little of a tangible nature is accomplished. Fires burn on over half the state and floods increase in severity, while the forest gets thinner every year. So far as practical forestry is concerned, the conditions are about the same as they were twenty-five years ago.

A second difficulty is that the State of New Jersey owns no forest land; that it has no precedent for the purchase of land, and that to enter into the business of wood production, or aid even in the protection of private forests, would be bad policy. The silly argument is often heard, even in the New Jersey legislature, that it is unfair for the cities and farmers of the central part of the state to pay taxes for the protection and improvement of forest lands in the remoter districts. On one occasion, at least, the state discouraged a gift of land from private owners because it feared to grapple with the duties and responsibilities which such a matter required. When lands have come into state possession in various ways, they have been promptly sold to the highest bidder.

A third difficulty is that the railroads practically own the state. They have heretofore opposed measures which

would impose upon them duties and outlays in respect to fire. New Jersey has been regarded mainly as a tract of poor sandy land, which must be crossed as quickly as possible from Pennsylvania and elsewhere to New York and the seashore. The only resource of any consequence in the sandy plain district was soon consumed by fire. Once every five years an area equal to a third of the state has been burned over, and there is nothing gained in concealing the fact that 75 per cent of these fires were set by sparks and hot ashes from locomotives. Times are changing, however, and even the railroads are beginning to realize that it is poor policy to oppose the passage of reasonable forest laws, and that in the end they do themselves as much damage as they cause to others. To be sure, they pay damages when the court orders them, but the amount paid in the past has been exceedingly small in proportion to the damage done. As one of the greatest of timber consumers and as long-lived affairs, these corporations are naturally beginning to have some concern regarding future supplies.

The public is ready for the establishment of a definite state forest policy, and a majority of the people wonder why something is not done. Legislative enactment in this case, as is usual, lags behind public opinion mainly because there seems to be no man in power who has the inclination, or knowledge of the subject, to act as a leader in the work. A man is needed who will unite all the various forces at work and steer the whole in the proper direction. We no longer need mere bureaus of information and the publication of tracts. The press is eager enough to do this work, and is able to do it as well, if not better, than the state itself. There is hardly a session of the legislature when one or more forest-fire bills are not proposed and sometimes passed, but they all fall short of the requirements. They are well meant, and indicate an active interest in the right direction; but they are proposed by men familiar only with local conditions and without a knowledge of the problem as a whole.

There is needed, then, a bureau of forestry, with a practical forester at its head. It is only through a permanent organization of this nature that intelligent treatment of the remaining forests of the state will be brought about. There should also be active coöperation on the part of the state with private owners who are anxious to improve their woodlands. At present New Jersey is far behind New York and Pennsylvania in this respect.

So much for the difficulties in the way. On the other hand, New Jersey has many advantages which other states do not, and in many instances cannot possess. First of all, the state has plenty of money, a portion of which could not be used to better advantage than in bringing about an improvement of existing forest conditions.

Another advantage is location. Some regions, such as western North Carolina and eastern Tennessee, although possessing great forest resources, are hampered in their development because of their inaccessibility. On the other hand, New Jersey in many ways has the choicest location in the United States. It lies near a number of the greatest cities in this country; transportation by rail and water is at hand, and in addition the state possesses many good wagon roads.

New Jersey contains a large amount of land better suited for raising timber than for any other purpose. This land is diverse in nature—mountainous in the north and mainly sand plains in the south—but in either case it is land on which a great variety of forest trees can be grown.

In no state of the Union is the water question of greater importance. Not only are the floods of northern New Jersey frequent and destructive, but vast areas of land are of great value for the purpose of furnishing pure, clear water to the cities within the borders of the state. Wood is needed for home industries, and in all the country there is no more convenient place for the manufacture of agricultural implements, wagons, and a host of other useful things.

A slight precedent has been established in the line of reservation policy

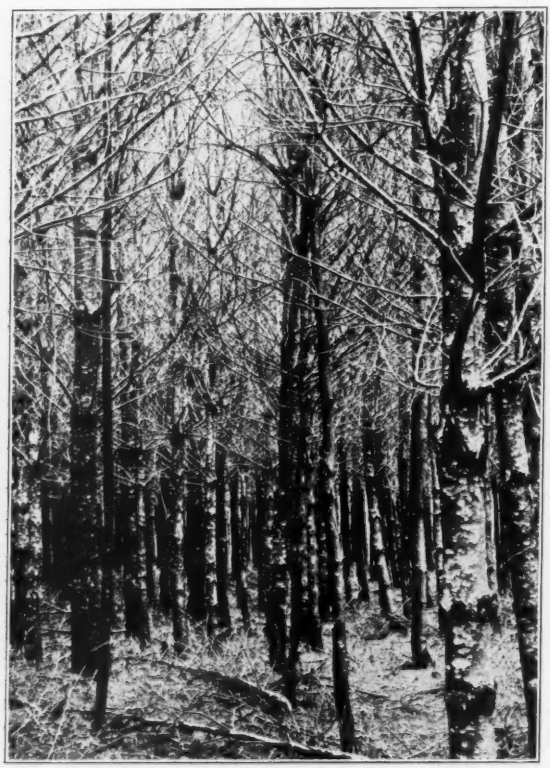
in aiding in the purchase of the Interstate Palisades Park. This was a half-hearted piece of work, laboriously brought about mainly through the exertions of New York people. This was not for the sake of forest preservation, but to check the ravages of quarrymen on the face of the Palisades. In short, very little has been accomplished, and there is little hope of accomplishing much until the problem is taken up seriously, on a well-organized basis by an able forester with ample funds at his disposal.

WHITE PINE PLANTING IN NEW ENGLAND.

By Harold B. Kempton,

Bureau of Forestry.

FOR the past century eastern forest lands have been rapidly denuded of their timber. Fire has been allowed almost complete control over much of the cut-over land, with the result that reproduction of the better species has been almost entirely prevented, while rapid-growing, worthless trees have taken their places. The impoverished condition of eastern forests, the low cost of available lands for forest production, together with the general prosperity of the people, and the lead of public-spirited citizens, have served to awaken interest in forest planting in New England.



PLANTED WHITE PINES, SHOWING DOMINANT AND SUPPRESSED TREES, MOULTONBORO, NEW HAMPSHIRE.

The tree most commonly used for forest planting in New England, and which brings the best results, is the White Pine. The reasons for this are its ready adaptability to varying conditions of soil and climate, its rapidity of growth, its beauty, and the value of its timber.

White pine forest planting in New England may be divided as follows: watershed planting, planting on sand barrens and seaside dunes, planting on bare lands and worn-out pastures, planting on cut-over land, and planting for the home woodlot.

WATERSHED PLANTING.

Many of the larger towns and cities store their water

supply in natural or artificial reservoirs, either of which collects the drainage water from a considerable area surrounding it, or from a brook or river. Seldom a year passes when some contagious disease does not spread through towns or cities as a result of impure drinking water. Frequently the reservoirs become dry owing to the uneven flow of the streams upon which they depend. These streams, having bare watersheds, flow in torrents in the spring, and much of the water is wasted. Later in the season they run dry, and the small pools formed in their basins become stagnant.

To these stagnant pools the germs of disease have free access and in them find the conditions for development. After the first heavy rain they are washed into the reservoir below, sometimes contaminating the entire water supply of large cities.

PLANTED WHITE AND RED PINES, NEW HAMPSHIRE. TREES IN THE FOREGROUND HAVE BEEN ATTACKED BY THE WHITE PINE WEEVIL, EFFECT OF WHICH IS SHOWN IN THE DOUBLE LEADERS.

The planting of forest trees on watersheds has not been much practiced as yet, but the necessity for it is attracting the attention of some of the most prominent water companies in America. All pastures and bare lands on such watersheds should be covered with forest trees, and, whenever natural reproduction cannot be depended upon, planting should be resorted to, with the ultimate purpose of lumbering. Figures can now be produced which show that planting may be practiced without loss. It therefore becomes a problem which should be carefully considered by every water company having waste or idle lands. The effects of an evenly distributed forest on the watersheds are as follows: purification of the water, regulation of the flow, prevention of erosion, and hence of turbidity, cooling and shading effect, conversion of the watershed lands into a beautiful park, and eventually practical lumbering at a profit on the whole investment.

An example of practical watershed planting on a large scale may be found at Clinton, Mass., where the Metropolitan Water Board, which supplies Boston and many surrounding cities with water, is planting 1,500 acres in White Pine and Hard Maple, according to plans prepared by the Bureau of Forestry. Planting is being done on the old farms, pastures, and bare, waste lands upon the watershed of their immense reservoir. Areas which already contain forest trees will be managed with the idea of producing a crop of timber from this natural growth.

PLANTING ON SAND BARRENS AND SEASIDE DUNES.

In Connecticut, Rhode Island, New Hampshire, Massachusetts, and other eastern states, there are large areas of sand plains or waste, barren lands which at present are a source of expense to their owners. It is not practicable to farm them, as there is not sufficient fertility in the soil to produce crops, and it is not advisable to fertilize them, for the first heavy rain would cause a great loss of fertilizer through seepage into the porous soil. Little tree growth is present, except occasional trees and bushes. The ground is covered for the most part with grasses of inferior value. It has been shown in a plantation at Shakers, Conn., that these lands will produce a good growth of White Pine. In pure, drifting sand the trees in this plantation have made an average annual height growth of 1.44 feet per year from the time when 4 to 6 inch seedlings were planted, 25 years ago, up to the present, the average height now being 36 feet. This height growth, even though the trees are in sand, is greater than the average height growth of planted White Pine in the East, which at 25 years of age is only 32 feet, an average of 4 feet less than the plantation in the sand. As shown above, successful planting can be practiced here with as great returns as in many of the more valuable soils.

WHITE PINE PROTECTIVE PLANTATION TWENTY-TWO YEARS OLD, EAST GREENWICH, R. I.

At the seaside the problem is often not so much of practical money-making as of preventing drifting sand from destroying valuable property. Near the coast the White Pine is not the best tree for this use, owing to the injurious effect of salt winds upon its foliage. However, for the interior sand lands of the East, north of the Carolinas, no better tree can be recommended for planting.

PLANTING ON BARE LANDS AND WORN-OUT PASTURES.

Under this head may be considered lands of immense extent in the East which are practically worthless for other purposes, yet which show favorable conditions for forest planting. In many regions, especially in Massachusetts, Connecticut, and New Hampshire, these bare lands are slowly being covered naturally with White Pine. This growth in most cases will never be of value, because, standing as it does in the open, it is low and branching. Such trees, if sufficiently large, may be left

to act as seed trees, but usually it is better to remove them and cover the area with an even stand of young pines. Two-year-old seedlings may be planted on such lands, while on sprout or bushy areas transplants should be used. The use of seedlings reduces the cost of plants more than 50 per cent. In locations of this nature planting may usually be done directly in the sod by merely lifting a small portion of it, placing the roots beneath, and then pressing it again into place. Where the sod is very dense a small square (4 by 6 inches) should be removed for each plant and the little tree planted in the cavity thus formed.

PLANTING ON CUT-OVER LANDS.

In almost every eastern state there are large areas of forest land which have been cut over and since have been annually swept by fires, gradually driving out the valuable species and leaving scrubby oaks, cherry, maple, poplar, and shrubs to reproduce either from sprouts or seeds. Such land presents the most difficult of tree planting problems, and usually planting is impracticable upon them. There is necessity for added care and expense to protect the young seedlings both from fire and from being smothered by the rapid-growing natural shrubbery. The expense of planting is greatly increased, for all dense sprout growth must be removed. Larger seedlings or transplants must be used in order to advance the growth as much as possible. The cut-over lands may be divided for the guidance of the tree planter into recently cut-over areas which have not been visted by fire, cut-over areas where fire has bared the ground, areas where sprout growth is scarce, and areas where sprout growth is of poor quality for commercial purposes.

The first of these conditions can seldom be used to advantage by the tree planter, for usually valuable species will reproduce naturally. Recently burned areas frequently present the most satisfactory conditions, and where the planting of three-year-old once-transplanted White Pines is done the spring following the fire, success may be expected. Cut-over burned areas, and areas where sprout growth is scarce or of poor quality, sometimes present conditions which can be used by the practical tree planter, but usually planting under such circumstances cannot be profitable in the present stage of American forestry.

THE HOME WOODLOT.

The most practical forest planting for the general public is the home woodlot. On almost every farm there are at least a few acres which are valueless for other purposes, and which might be used to produce fuel, fence-posts, and timber for the construction of farm buildings. The farmer need not go to much expense, for he can usually collect his own seed or seedlings for planting. If his land is unsuitable for direct seed planting he may either gather his seedlings in the forest or grow them in his own nursery. The value of such a woodlot for the farm is not restricted to the actual amount of posts, fuel, or timber which it may produce; but it gives in addition beauty to the farm grounds and protection from winds. Frequently in New England the cause of unsatisfactory yields from orchards and various other perennial crops is the lack of snow protection about the roots during winter. A combined woodlot and windbreak from one to several rods in width, extending about the orchard or garden, will gather the snow evenly over the enclosure. Protection is thus afforded where otherwise the wind would sweep the land bare, piling the snow in heaps about the fences, roads, and buildings. Farmers living near towns can usually find a ready and profitable market for excess posts and fuel from the woodlot.

SUNNYSIDE CANAL, A FEW MILES BELOW THE INTAKE.

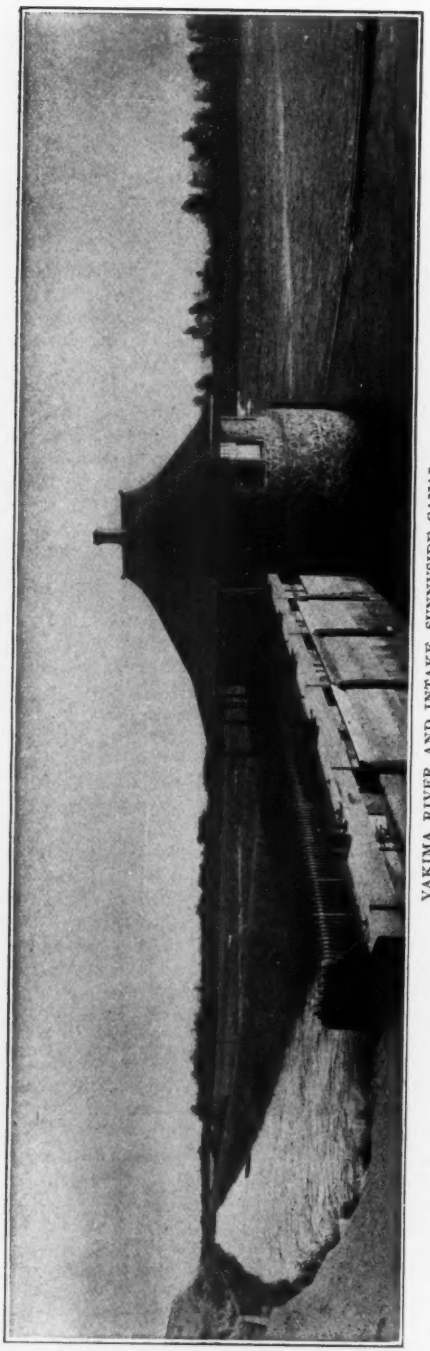
NOTABLE IRRIGATION WORKS.

I.—THE SUNNYSIDE IRRIGATION CANAL.

IN 1889 irrigation upon a large scale was first contemplated and took practical form in the Yakima Valley, Washington. During that year a number of prominent business men, after carefully examining all the arid lands along the line of the Northern Pacific Railroad, reached the conclusion that no section presented greater advantages for a complete irrigation system than the valley of the Yakima River. Here they found a river fed by the perpetual snows, streams, and lakes of the Cascade Mountains, which, at its lowest stage, contained an abundant supply of water. They found a soil averaging some 30 feet in depth and of a richness scarcely to be met with elsewhere in any arid section. They found a country diversified as to surface, portions of it rolling and other parts with gentle slopes. The climate was equable; no excessive heat in summer nor extreme cold in winter, and a nominal rainfall. Here, too, they found a small ditch, which some fifteen years prior a few farmers had constructed, and along it they had built homes and had in bearing orchards, from which each year they were reaping rich harvests. This ditch left the Yakima River just below a gap where it cuts between two high hills. Nature seemed to have designed it as a place for an intake of a great canal. At once an agreement was made with the farmers by which their ditch, known as the Konnewock, was to be owned by a new company and enlarged and extended, so as to carry 1,000 cubic feet of water per second of time and serve 68,000 acres of land.

In 1890 work was commenced and continued until the main canal was completed to nearly the forty-second mile post, laterals were constructed, and land sales made. In 1892 water was first used by the new settlers from the main canal. In 1893 the great panic stagnated everything, work was stopped, and the settlers lived as best they could. They had before them what the farmers had accomplished under the Konnewock ditch, and they did not lose faith. They cleared their land of the sage brush, leveled it, and placed water upon it; they planted fields of alfalfa, clover, timothy, corn, and potatoes, and set out orchards of peaches, prunes, pears, apricots, cherries, and apples. Nature seemed to prosper their efforts. By degrees others came into the country, who were induced to come by reason of the letters sent them by the first settlers.

Already between 4,000 and 5,000 people live along the Sunnyside Canal, and 20,000 acres of land are under cultivation, showing that it has passed out of the experimental stage. The fact has been established that in no part of the country can a large ditch be more easily constructed or maintained. The amount of water appropriated is 1,000 cubic feet per second of time. That this is an ideal country for horticulture is well known by the many settlers on the land, and the fruit merchants of Puget Sound cities, Butte, Helena, Winnipeg, Minneapolis, St. Paul, Duluth, Chicago, Milwaukee, and many other eastern cities, for from this section already large quantities of fruit have been shipped to these points. A glance at the map of the West will show that the valley of the Yakima is most fortunately situated for both farming and horticulture. Throughout its whole length runs the great Northern Pacific Railway, and from Portland, Oregon, another railroad is projected, and is partially constructed, while the navigable Columbia River is close at hand. For miles on both sides of the Yakima River stretches the foothills of the Cascades. Here, yearly, large flocks of sheep, herds of cattle, and bands of horses range. These during the winter must be fed, and the cattle and sheep fattened for market. For the



YAKIMA RIVER AND INTAKE, SUNNYSIDE CANAL.

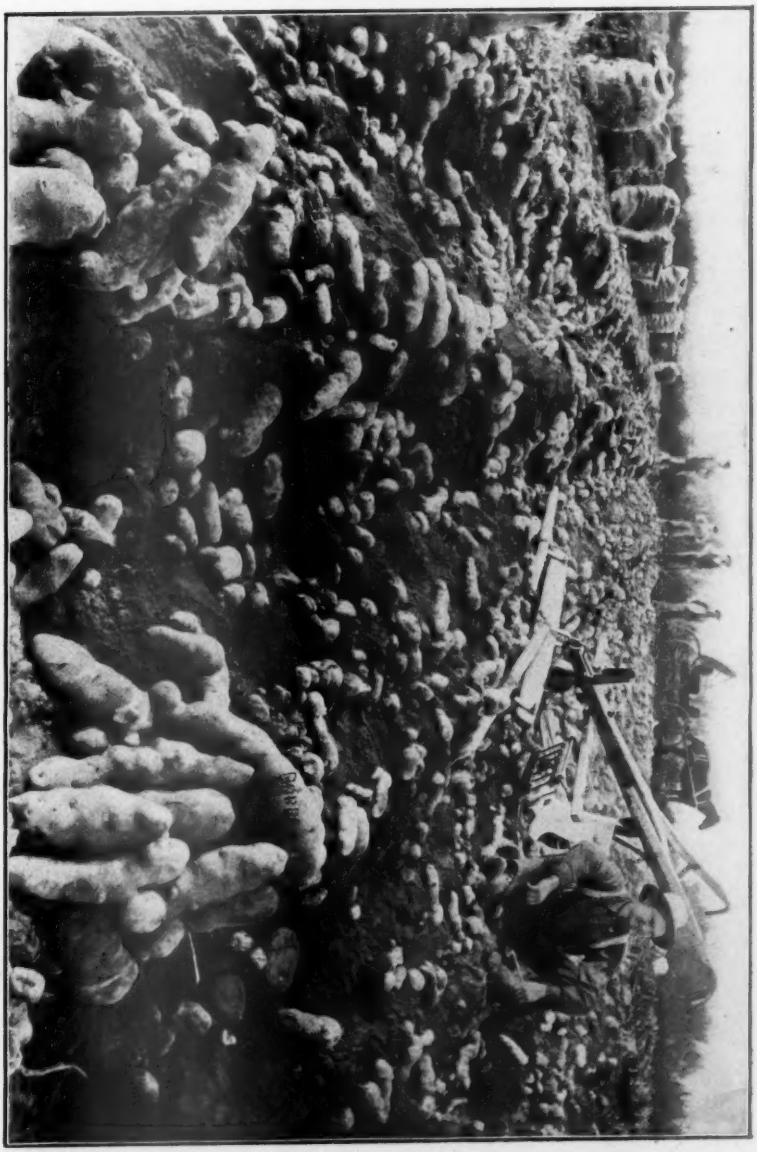
last few years large numbers of them have been fed by the farmers of the Sunnyside country. In this way alfalfa has been disposed of at $4.50 per ton in the stack. When one realizes that an acre of Sunnyside land produces eight tons of alfalfa, the rate of profit is at once apparent.

There is no danger of an overproduction of hay in the Yakima Valley, for there is scarcely a year when any hay is left over in this section. The cities of Puget Sound, the logging camps of the great wooded belt west of the Cascade Mountains, and of late Alaska, the Hawaiian and Philippine Islands have become great hay-consumers.

It is, however, in the growing of fruit that the rich lands of the Sunnyside section can be best utilized. In the great Northwest a large and increasing population dwells, and the amount of green, canned, and dried fruit consumed by the people of this belt is enormous. Fruit shipped in car-load lots from the Yakima Valley is a common occurrence, and the day is near at hand when it will be moved in train-loads. That the railway company is in accord with Sunnyside on the line of horticulture is shown by the following statement by President Mellen, of the Northern Pacific: "Not a bushel of fruit will rot in the Yakima Valley by reason of an excessive freight rate." As evidence that fruit does not rot in the Sunnyside country, over two years ago two large fruit evaporators were erected, but so great has been the demand for the green products that these dryers have scarcely been operated.

The Washington Irrigation Company of Zillah, Washington, is proprietor of the Sunnyside Canal.

Owing to the recent large sales of land by the Washington Irrigation Company, it has become necessary to extend the main canal from the forty-second mile post to opposite the town of Prosser, a distance of 14 miles. The town of Prosser is a live place, and the Prosser Falls at this point in the Yakima River are capable of generating 2,500-horse power, part of which is already used in pumping water, driving a flour mill, and generating electricity for lighting the town.



POTATOES GROWN BY IRRIGATION NEAR NORTH YAKIMA, WASHINGTON.

FOREST FIRE RECORD.

MANY DISASTROUS FIRES DURING JUNE.

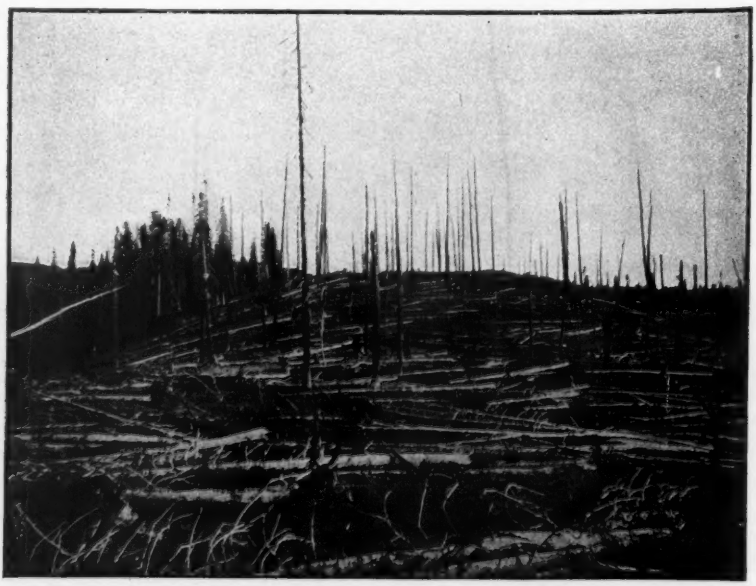
THERE were many forest fires during June, some of which were the most destructive of recent years. Several people lost their lives in these fires, while the damage to standing timber, conservatively estimated, must have been near $5,000,000.

Washington.—On June 20, 550,000,000 feet of valuable timber along the line of the Northern Pacific Railroad was destroyed by fire. This timber was located in five districts in the vicinity of Buckley, Enumclaw, Lester, and Hot Springs, and covered an area of about sixty-three square miles, all of it being convenient to the railroad. The estimated value of the timber destroyed is $1,100,000.

At Buckley, Enumclaw, Lester, and Hot Springs the greatest danger from the fire was experienced. At one time many of the residents of these places had their household goods loaded in wagons and teams attached ready to move on an instant's notice. Farm property in the vicinity of Enumclaw was greatly damaged. The big sawmill of the White River Lumber Company, together with twenty houses, mill buildings, dry kilns, and a large amount of sawed lumber were destroyed. It is thought that several lumbermen lost their lives in the Buckley fire.

The Tacoma fire department was called upon to aid in fighting the fire at Hot Springs, the well-known health resort. Firemen with engines and hose were sent by special train, and by hard work the large hotel at the Springs was saved.

The Page Lumber Company's camp at Eagle Gorge was destroyed and the employes had a narrow escape. The fire came upon them very suddenly, and only a narrow path to safety remained; through this men, women, and



RESULT OF FOREST FIRES IN BATTLEMENT MESA RESERVE, COLORADO.

FOREST RUINED BY FIRE, WHITE RIVER RESERVE, COLORADO.

children to the number of sixty hurried through.

On the same day at Kanaskat a tract of seven square miles was burned, and at Covington also a large area was traversed by the flames. In Snokomish county the loss to timber amounted to at least $20,000.

Colorado.—Near Ouray a fire on Corbett Creek damaged at least 5,000 acres of the best timber in the vicinity. In the Lightner Creek district near Durango fires destroyed many miners' cabins, and at one time a band of 2,000 sheep were hemmed in by the flames. One estimate of the loss of standing timber in the mountains west of Durango places it at $1,000,000.

An area of ten square miles of timber was burned over near Rudi, Pitkin county, early in June. The American Gold Dredging Company, whose plant is located near Breckinridge, lost 2,000 cords of wood in a recent forest fire. There were also a number of destructive forest fires in the Leadville district during June. A forest fire near Dillon destroyed nearly 3,000 acres of timber.

Register Joyce, of the State Land Board, claims that some of these fires have been of incendiary origin, and a strong effort is being made to apprehend the guilty parties.

California.—On June 29 a forest fire in the Tuolumne Mountains threatened the destruction of the famous Tuolumne grove of Big Trees. The fire was due to the carelessness of a government surveying party in failing to put out signal fires. The embers were scattered by a high wind at night, with the result of the flames spreading across the mountains in the direction of the Big Tree Grove. A message was sent to Wawona, asking that soldiers be sent to the scene to assist in fighting the fire, and they responded at once. A large acreage of pasturage has been destroyed, and some of the most picturesque portions of Tuolumne county have been burned over.

A forest fire which was started by careless campers on Nendenhall ranch, near Livermore, destroyed several dwellings. Forest fires were also reported from O'Byrnes Ferry.

Wyoming.—Forest fires are reported from Elk Mountain and Timber Mountain, the latter destroying the buildings

at the Cumberland Mine. Elk Mountain lies within the borders of the newly created Medicine Bow Forest Reserve, and contains some of the finest timber in the state.

Tennessee.—A serious forest fire, which destroyed a number of houses and barns, occurred in the mountains near South Pittsburg on June 26. Hundreds of people turned out to fight the flames, one of whom, Mrs. Mary Levan, was burned to death.

Arizona.—The serious forest fires which broke out in the Huachuca Mountains late in May continued to burn until nearly the middle of June. A large amount of timber was destroyed, and many mining properties were saved only through the hardest kind of work on the part of the fire-fighters. Two companies of soldiers from Fort Huachuca were called out to help fight the flames.

Virginia.—A forest fire in the Dismal Swamp, Nansemond county, destroyed several hundred acres of timber, and also several houses near Copeland.

Wisconsin.—Forest fires late in June were reported as occurring near Wausau, the damage being slight.

IRRIGATION IN THE EAST.

STATISTICS FROM THE TWELFTH CENSUS.

WITH the passage of the Newlands irrigation bill unusual interest is being shown in the subject of the development of the arid West. In this connection, it might be well to call attention to the increasing tendency among the farmers of the East to resort to irrigation.

The Twelfth Census was the first in which any attempt has been made to ascertain the number of irrigators in the humid regions. The chief difficulty experienced was that irrigation is so widely practiced in a small way though it is almost unknown by this term. In every city, town, village, and well-settled suburb of the country the watering of lawns and gardens is carried on as a matter of course. People do not designate this as irrigation, yet that is really what it is, The line between watering in this way and the systematic irrigation of larger fields is very difficult to draw, and thousands of instances of watering of market gardens, even of considerable size, have probably been overlooked simply because this operation has not been designated by the term of irrigation.

The distinction between subirrigation and drainage is also one which is very difficult to make. Some lands which are low and naturally too wet for successful tilling have been made useful by systems of drains. These are operated in such a way that they serve to irrigate the land in a measure by subsurface means; and the alternate checking of the drains to secure additional moisture in times of drought, and opening them wide to take away superfluous moisture is in effect a method of irrigating.

With these difficulties in view, it is readily seen that the number of irrigators reported in any humid state may be notably increased by a slight difference of opinion. The census figures, however, serve to show that a considerable number of farmers place dependence upon an artificial supply of water, even in humid climates.

The large value of products realized from the investment in irrigation systems testifies to the wisdom of this course of action.

Maine.—Irrigation is reported from Maine on 11 farms in 1899. Of the 17 acres irrigated, 15 were in vegetables and small fruits, and 2 in hay. On most of the farms the water was pumped from wells and directed upon the land through pipes and hose. The cost of the irrigation systems was $2,170, or $127.65 per acre, and the value of the irrigated crops was $2,555, or $150.29 per acre.

Massachusetts.—In Massachusetts irrigation was practiced on 28 farms in

1899. The majority of these farms are located in Barnstable, Middlesex, and Worcester counties. The total acreage irrigated was 134, the principal crops being garden truck, celery, and hay. More than 80 per cent of the acreage irrigated was in garden produce.

The total cost of the irrigation systems was $14,680, and the total value of the irrigated products was $31,325. The yields of some of these truck farms are very large, one farmer reporting an income of $11,000 from 4 acres in truck, 2¾ acres being under glass.

Connecticut.—While Connecticut is well supplied with running streams, the contour of the country is such that it is impracticable to irrigate large areas. The most favorable spots for the artificial application of water to aid in the growing of crops are on the bottom lands edging the streams, lands principally used for meadows. Here ditches are constructed and limited areas are irrigated with comparatively little cost. For land of greater elevation irrigation involves a considerable increase in expense.

In 1899, 56 farms made use of irrigation. The total area under ditch was 471 acres, an average of about 8 acres per farm. The cost of the pipes, ditches, pumps, and reservoirs used on these farms was $16,113, an average cost of $34.21 per acre irrigated.

Rhode Island.—Irrigation was reported on only two farms in Rhode Island in 1899. The area irrigated was 40 acres, the cost of irrigation systems $3,000, and the acreage irrigated was in vegetables.

New Jersey.—Irrigation was reported on eight farms in 1899. Of the 73 acres irrigated, 69 acres were devoted to crops, as follows: hay, 26 acres; vegetables, 20 acres; corn, 13 acres; celery, 6 acres; seeds, 4 acres. The total value of the crops produced was $8,720, an average of $126 per acre.

The average value per acre of irrigated land was $155. The total capital invested in irrigation plants was $2,831, and the average cost of irrigating was $36 per acre.

New York.—In 1899 irrigation was reported on 11 farms, the area irrigated being 123 acres, and the cost of the systems $4,372, or $35.54 per acre. The total value of the irrigated products on these farms was $11,735, or $95 per acre. The acreage and values of the irrigated products were as follows: vegetables, 20 acres, valued at $5.015, or $250.75 per acre; tobacco, 2 acres, valued at $200, or $100 per acre; small fruit, 10 acres, valued at $2,600, or $260 per acre; miscellaneous crops, flowers, plants, etc., 25 acres, valued at $860, or $34.40 per acre.

The most extensive irrigation plant in the state, located in Rensselaer County, irrigated 55 acres. A small mountain stream furnishes the water, which is diverted into a large reservoir 210 feet above the land to be irrigated, and thence directed to the land through cast-iron pipes. In the spring and autumn the water is turned upon a Pelton wheel, the power developed being utilized in the operation of a saw-mill.

No reports were received of numerous irrigation systems on the small truck farms in the vicinity of several of the large cities of the state. Many of these farms are operated by Italians and Chinese, and their irrigation plants are usually very inexpensive, the water being supplied chiefly from the city water mains and delivered to the land through garden hose.

Pennsylvania.—Irrigation began more than one hundred years ago, in Berks county, where small areas of bottom lands were artificially flooded as early as 1800. Until recent years the practice of irrigation was confined to narrow and comparatively level strips of land edging the streams, upon which water could be diverted easily and at slight expense. The hilly nature of the country in which irrigation was first introduced precluded the possibility of any considerable extension of irrigated areas.

The acreage artificially watered in 1899 was devoted principally to hay, more than 93 per cent of the total area irrigated being in this crop. A large part of this acreage was reported from Monroe, Northampton, Lehigh, Bucks, Berks, and Lancaster counties in the southeastern part of the state. In 1899

the acreage of hay irrigated was 758, and the value of the crop was $17,920, or $23.64 per acre.

The value of irrigation in truck farming as an assurance against loss by drought has been demonstrated in several counties, and the reports from the irrigators show a very large income per acre. The methods of irrigation on these farms vary greatly, and the cost is much higher than on farms where hay is the only crop irrigated.

The water is generally pumped from driven wells by steam-power or windmills. In the vicinity of large cities the farmers occasionally use city water. Notwithstanding the heavy original cost of engines, pumps, pipes, etc., in nearly every instance the value of the irrigated crop reported was equal or exceeded the first cost. In 1899 the average value per acre of the products derived from irrigated land devoted to truck farming was $330.43.

A WORKING PLAN FOR ARKANSAS FOREST LANDS.

THE latest bulletin * issued by the Bureau of Forestry contains a working plan for the timber tract of the Sawyer & Austin Lumber Company, near Pine Bluff, Arkansas. This working plan, which is already in operation, is the outcome of an application to the Bureau of Forestry by this firm for assistance in the management of their forest lands. The field-work necessary to the preparation of this working plan was conducted by Mr. Frederick E. Olmstead, field assistant in the Bureau.

This working plan includes a careful study of the problems of markets, taxes, and transportation; also the effects of fire and grazing. There are tables showing the stand per acre of the most important timber trees, and diagrams illustrating the rates of height and diameter growths of the leading species. The report is well illustrated with a number of half-tone plates.

The preparation of this working plan for the Sawyer & Austin tract is further proof of the striking manner in which practical forest methods are commending themselves to lumbermen throughout the country. Nowhere is the tendency more marked than in the southern states, from which the Bureau of Forestry has been asked for assistance in the management of more than 1,500,000 acres of private forest lands. Already several working plans in that region have been completed and are now in operation.

The forest lands of the South are among the most extensive in the United States to-day, and the development of the lumber industry in that region during recent years has been remarkable. The tendency of southern lumbermen to exploit their holdings along conservative lines is an encouraging sign, and it may reasonably be expected that this early acknowledgment of the value of practical forest methods in lumbering will in many cases prevent a repetition of the wasteful methods that have in great measure crippled the lumber industry in Pennsylvania, Michigan, Wisconsin, and other regions formerly well timbered.

The information contained in this bulletin should interest lumbermen generally, but it is of special value to southern lumbermen, for many holdings of timber lands in that region are likely to present many of the same problems encountered on the Sawyer & Austin tract.

The timber lands of the Sawyer & Austin Lumber Company are situated in portions of Grant, Jefferson, and Saline Counties, Arkansas, and lie south of the Arkansas River, about 100 miles from where it empties into the Mississippi. They comprise 105,000 acres, about 5 per cent of which is bare of merchantable timber, and the property is very much cut up by farm lands and other private holdings.

On the tract of the Sawyer & Austin

*A Working Plan for Forest Lands Near Pine Bluff, Arkansas. By Frederick E. Olmstead, field assistant, being Bulletin No. 32, Bureau of Forestry.

Lumber Company one of the chief objects in making a working plan was to determine whether the present tract is large enough to furnish a sustained yield to the yearly capacity of the mill, and, if not, to estimate the additional area necessary to secure such a result.

The conclusions reached in this working plan may be summarized as follows:

The study made by the Bureau of Forestry establishes the fact that the application of practical forestry to the tract of the Sawyer & Austin Lumber Company would be a sound business measure. It shows, furthermore, that in the cheapness of logging, the value of the product, the quick growth and the ready reproduction of the timber trees, and the practicability of inexpensive and effective measures against fire, the opportunity is a markedly favorable one.

The yield to be expected from cut-over lands shows a high return from the capital invested in them Cutting to the advised diameter limit of 12 inches breast high, or about 14 inches on the stump, with stumpage reckoned at $2 per 1,000 board feet, and the value of cut-over land at $1 per acre, the average annual interest represented by the future crop on cut-over lands is for a period of forty years nearly 9 per cent. In other words, after the Sawyer & Austin Lumber Company have lumbered their present tract at the rate of 14,500,000 feet per year, the lands which have been cut-over will be producing timber which, at a conservative estimate, represents an income of 8.8 per cent on the capital invested in them.

It has been shown that, in order to assure a sustained annual yield equal to the capacity of the mill, the addition of 170,000 acres to the present tract is necessary. With this addition, or its equivalent in stumpage, the Sawyer & Austin Lumber Company can cut continuously 40,000,000 board feet a year. If this addition is not made, it is clearly unadvisable for the company to lumber its tract upon the principle of a sustained annual yield, since this would fall short by about 25,500,000 board

Courtesy Bureau of Forestry.

YOUNG LOBLOLLY PINES UNDER MATURE LOBLOLLY ON A PINE FLAT, SAWYER & AUSTIN TRACT, ARKANSAS.

Courtesy Bureau of Forestry.

HARDWOOD UNDERGROWTH UNDER MATURE PINE ON A PINE FLAT, SAWYER & AUSTIN TRACT, ARKANSAS.

feet of the annual capacity of its mill. The quantity of timber taken annually from the tract has no bearing upon the main question before the company: whether the application of conservative lumbering is justified by the value reasonably to be expected for a future crop of timber from the lumbered area. Under the very small added expense incident to the application of the rules for forest management, the productive capacity of the cut-over lands will be preserved, and they will supply a second crop of merchantable timber, which represents an exceedingly good rate of interest upon the capital invested in them. Whether the second crop is grown in order to be cut by the Sawyer & Austin Lumber Company, or whether the cut-over lands be sold after the merchantable stand is removed, has no bearing on the advisability of conservative lumbering in the present case. The increased value of the cut-over lands in either event renders the application of practical forestry in the lumbering now going on a safe and advantageous business measure.

RECENT PROGRESS IN DENDRO-CHEMISTRY.

REVIEW OF RECENT ARTICLES IN THE LEADING CHEMICAL JOURNALS.

By William H. Krug,

Bureau of Chemistry, U. S. Department of Agriculture.

Robinin, Violaquercetin, Myrticolorin, and Osyritrin. A. G. Perkin (Journ. Lond. Chem. Soc., 81, 473). The author has continued his investigation on the properties of myrticolorin, $C_{27}H_{28}O_{16}$, a quercetin-glucoside occurring in *Eucalyptus macrorrhyncha*. Smith (Journ. Lond. Chem. Soc., 73,

697) stated that it differed from osyritrin by yielding galactose on hydrolysis, but subsequently found the sugar to be dextrose. The results obtained by the author confirm this and show that myrticolorin and osyritrin are identical.

A Rational Method for the Utilization of the Waste Liquors Obtained in the Manufacture of Sulphite Pulp. Th. Knoesel (Chem. Ztg., 26, 229). The liquors are concentrated to 25° Beaumé in a reverberatory furnace and mixed with an equal volume of Thomas slag, whereby a solid, brownish-yellow mass, having a pleasant vanillin-like odor and only sparingly soluble in water, is obtained. The phosphoric acid of the Thomas slag is completely converted into the citrate soluble form. The process is protected by German patent 128,213.

The Ethereal Oil of Sweet Orange Flowers (Neroli-Portugal Oil). E. Theulier (Bull. Soc. Chim. Paris, (3), 27, 278). The crude oil obtained by direct distillation of the flowers is dark yellow and has an odor resembling in no respect ordinary neroli oil: $D^{23} = 0.860$, $(a)_D = +29.30$. The oil contained 6.33 per cent of esters (calculated as linalyl acetate), contained no anthranilic acid methyl-ester, and yielded a deposit of paraffin (melting point — 55° C.) when cooled. The presence of a considerable quantity of high-boiling terpenes and of d-camphene, d-limonene, and d-linalool was demonstrated.

The Sugar of the Mahwa Flowers. E. O. von Lippmann (Ber. deutsch. chem. Ges., 35, 1448). The Mahwa tree is found throughout India and the East Indies. The wood is very hard and is used in various ways, the fruit serves as food, the fruit kernels yield a fat, and the fresh flowers serve as a source of an unpleasant-tasting fermented liquor. Several hundred kilograms of fleshy flower petals are obtained from a single tree, which yield as much as 60 liters of alcohol by fermentation. The fresh petals were found to contain invert sugar. Cane sugar was absent, but it is possible that it may have been originally present, being converted into invert sugar after the petals had fallen.

A New Color Reaction for Woodfiber in Paper. A. Kaiser (Chem. Ztg., 26, 335). When amyl alcohol, free from furfural, and concentrated sulphuric acid are heated on a water bath to 90° C. and cooled, the resulting amyl-sulphonic acid has the property of coloring woodfiber red, violet, or intensely indigo blue, depending on the quantity present in the paper. The color reaction is hastened by passing a current of air over the same or by applying a gentle heat.

The Resin of *Dammara orientalis* (Manila Copal). Tschirch and Koch (Arch. d. Pharm., 240, 202). According to Wiesner, this copal is obtained from the conifer *Dammara orientalis*. It forms soft, reddish-yellow pieces soluble in alcohol, ether, and an 80 per cent chloral hydrate solution, partially soluble in acetic ether, chloroform, benzol, and methyl alcohol, only slightly soluble in carbon tetrachloride and petroleum ether. The melting point is 115° C., saponification number about 190, iodine number 55. The chemical examination yielded the following constituents: I. Free acids (about 80 per cent), consisting of (*a*) mancopalinic acid, $C_8H_{12}O_4$; (*b*) mancopalinic acid, $C_8H_{14}O_2$; (*c*) a-mancopalic acid, $C_{10}H_{18}O_2$; (*d*) b-mancopalic acid, $C_{10}H_{18}O_2$. II. Mancopalresene (yield, 12 per cent), $C_{20}H_{32}O$. III. Ethereal oil (yield, 6 per cent). The properties of these constituents and of some of their derivatives are described in detail.

The Action of Concentrated Nitric Acid on Caoutchouc. R. Ditmar (Ber. deutsch. chem. Ges., 35, 1401). The oxidation with nitric acid yields a yellow, amorphous substance soluble in ethyl acetate, benzaldehyde, and nitrobenzol, insoluble in water, chloroform, alcohol, benzol, and petroleum ether. The substance has an indefinite melting point (about 142° C.) and is decomposed at higher temperatures. The analysis indicates the formula $C_{10}H_{12}N_2O_6$. It is soluble in alkalies, and is precipitated from this solution by acids. The properties indicate that it is a monobasic acid.

The East Indian Papaya. Wm. Thos. Fee (Consular Reports, 68, 259, 511). The Papaya tree, *Carica papaya*, is found

in India, the West Indies, and the southern part of the United States. In India the fruit is used very generally as a food. The whole tree contains a milky, viscid juice, which possesses powerful digestive properties due to the presence of an active principle, papain. The papain may be separated from the juice by precipitation with alcohol and retains its medicinal properties after being dried. In India the juice is also used as a cosmetic and vermifuge.

RECENT PUBLICATIONS.

The Desert: Further Studies in Natural Appearances. By JOHN C. VAN DYKE. Pp. 233. Cloth. Charles Scribner's Sons, New York. Price, $1.25 net.

At this time, when an unusual amount of interest is being shown in the reclamation of the arid regions of the West, "The Desert," by John C. Van Dyke, comes as a timely book. While written with the avowed purpose of describing the "beauties" of the desert, as seen through an artist s eye, the book nevertheless will greatly interest the general reader.

The author spent two years in the southwest exploring and studying in the Colorado and Mojave deserts, and his book contains a most vivid description of that great, silent country. The formation of the desert, its animal, bird, and plant life are all described in a charming manner. Mr. Van Dyke, through his love of "nature undefiled by man," no doubt sees more beauty in the desert than does the average person who visits it. In fact, he is an enthusiast and champion for the desert.

The author opposes the idea of reclaiming the desert, advancing the argument that by turning it into "an agricultural tract would introduce humidity and nullify the finest air on the continent." However, there is but little danger of such a result, from the fact that only a very small portion of the desert can be reclaimed.

His real objection is seen where he speaks of the "destruction of natural beauty" by our "practical men." They are treated in these words: "Men must have coal, though they ruin the valleys and blacken the streams of Pennsylvania; they must have oil, though they disfigure half of Ohio and Indiana; they must have copper, if they wreck all the mountains of Montana and Arizona, and they must have gold, though they blow Alaska into the Behring Sea. They have stripped the land of its robes of beauty; and what have they given in place? Weeds, wire fences, oil derricks, board shanties, and board towns; and at last they have turned to the desert!"

It must be admitted that man has in many instances marred the beauty of the land, but in turn produces many useful things, and we agree with Victor Hugo when he says that "the useful is as beautiful as the beautiful." Man will change only small portions of the desert's area, and very little of its natural beauty will ever be destroyed. On the other hand, we are of the opinion that prosperous agricultural communities here and there on the desert's present broad area will add to, rather than detract from, its sombre face.

Though one may disagree with the author's idea of the utility of the desert, there is no denying that he has written a book that contains an unusually graphic description of a section of the country that is now attracting widespread attention. "The Desert" is written with all the charm of style that made his "Nature for Its Own Sake" and "Art for Art's Sake" so popular.

Forest Reserve Manual: For the Information and Use of Forest Officers. Published by the General Land Office, Department of the Interior. Pp. 90.

The "Forest Reserve Manual," recently issued by the General Land Office, with the approval of the Secretary of the Interior, contains a carefully prepared set of rules governing the administration of the forest reserves. It was written by Prof. Filibert Roth, Chief of Division R of the General Land Office, and Mr. Edward T. Allen, Inspector of Forest Reserves.

This manual contains the rules to be observed by the various forest officers in the discharge of their duties, information regarding the sale of timber in the forest reserves, and the rules governing the free use of timber. For the guidance of superintendents, supervisors, and rangers, there are blank forms of applications for all special privileges, rules regarding the scaling, marking, and estimating of timber, and many other matters likely to come up in the administration of the forest reserves. The manual further contains instructions regarding the penalties for violations of the forest reserve laws.

The "Forest Reserve Manual" should prove of great assistance to forest officers in the field. The rules are clearly drawn, and are likely to have a good effect in bringing reports from the field to the authorities at Washington in a more prompt and efficient manner. The manual will likely prove of decided value in developing this important service.

It is an attractive little volume, bound in red leather, with alternating blank pages for notes, and is of convenient size for carrying in the pocket.

The Kindred of the Wild: A Book of Animal Life. By CHARLES G. D. ROBERTS. Pp. 374, 50 illustrations. L. C. Page & Co., Boston. Price, $2.

Readers of that delightful book, "The Heart

of the Ancient Wood," by Charles G. D. Roberts, will undoubtedly be greatly pleased by his latest work, which is published under the title of "The Kindred of the Wild." This new volume describes with unusual fidelity the life histories of various wild animals, and deserves to be classed as one of the best books of animal stories that has yet been published. From the beginning one is impressed with the author's decidedly intimate knowledge of the forest and its inhabitants. The book is a collection of short stories, which include chapters on the moose, the wild goose, the cougar, the owl, the lynx, the eagle, and other inhabitants of the forest and the air The author writes of animal life with undoubted sympathy and we have no hesitancy in pronouncing it an unusually charming book.

A feature which adds much to the attractiveness of this volume is the large number of excellent illustrations by Charles Livingston Bull. Mr. Bull's drawings of animals have recently attracted wide attention, and this volume contains more than fifty of them, one of which is reproduced here. The volume is attractively bound in dark-green cloth, with an appropriate cover design.

"MOUNTED THE CARCASS WITH AN AIR OF LORDSHIP."

FROM "THE KINDRED OF THE WILD," BY CHAS. G. D. ROBERTS. COURTESY L. C. PAGE & CO.

Among the Water-fowl.
By HERBERT K. JOB. Pp. 224. Illustrated from photographs by the author. Doubleday, Page & Co., New York. Price, $1.35 net.

This attractive volume contains a popular account of the water-fowl found in the northern and middle states and lower Canada east of the Rocky Mountains

The book is divided into five parts. Part I, entitled "The Submerged Tenth," contains a description of the grebes and loons. Part II, under the apt title of "Modern Cliff-dwellers," describes the gannets, guillemots, auks, puffins, and kittiwakes. "Ocean Wanderers," including the shearwaters, jaegers, petrels, and phalaropes, are noted in Part III. Part IV deals with "The White-winged Fleet," the gulls and terns, while Part V is devoted to ducks and geese.

Mr. Job, the author, has studied the water-fowl over a wide range—from New England to Minnesota and the Dakotas and a large section of Canada. In this book he has given us a most readable description of many of the large

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A HERRING GULL IN THE PROTECTED COLONY AT GREAT DUCK ISLAND, MAINE, APPROACHING ITS NEST

FROM "AMONG THE WATER-FOWL," BY HERBERT K. JOB. COURTESY DOUBLEDAY, PAGE & CO.

water birds too little known. The author's work with the camera is in a great measure responsible for the attractiveness of the volume, and the illustrations made from his photos give an unusually intimate view of the habits of many of these water-fowl. Altogether, "Among the Water-fowl" is a most entertaining and valuable book. One of the many illustrations is reprinted here.

Harper's Magazine for July contains an article on "American Private Forests," by Mr. Overton W. Price, of the Bureau of Forestry, that deserves to be widely read. Mr. Price shows in this article how rapidly the idea of handling woodlands in a conservative manner is spreading among private owners. He also outlines methods for improving private forest lands, and points out the results to be expected when practical methods are pursued.

The Century for July contains a very interesting article on "Irrigation," by Ray Stannard Baker, as a further addition to its series of papers on the "Great Southwest." The article is splendidly illustrated with drawings by Maxfield Parrish.

PUBLISHER'S NOTES.

An unusual opportunity to purchase a valuable coal and timber tract is to be found in the announcement of Mr. R. W. Powell on another page of this issue of FORESTRY AND IRRIGATION. Mr Powell, who has for many years been prominent in the lumber business of Tennessee, is desirous of disposing of this tract to purchasers who will cut the timber in a conservative manner.

Mr. Powell is deeply interested in forestry, is on the executive council of the Tennessee Forest Association, and one of the most active members of that organization. We printed in the May number of FORESTRY AND IRRIGATION an article by Mr. Powell on the "Relation of Forests to the Manufacturing Industries of Tennessee."

The Misses Reynolds will remove their school, during the summer, from its present quarters, at No. 66 West Forty-fifth street, New York. The classes will reopen on Monday, October 6th, 1902, at the new address, due notice of which will be given. Their address during the summer months will be at No 101 Hudson terrace, Yonkers, New York.

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The farmer who contemplates changing his location should look well into the subject of irrigation. Before making a trip of investigation there is no better way to secure advance information than by writing to those most interested in the settlement of unoccupied lands. Several publications, giving valuable information in regard to the agricultural, horticultural, and live stock interests of this great western section have been prepared by the **Denver & Rio Grande** and the **Rio Grande Western**, which should be in the hands of all who desire to become acquainted with the merits of the various localities. Write

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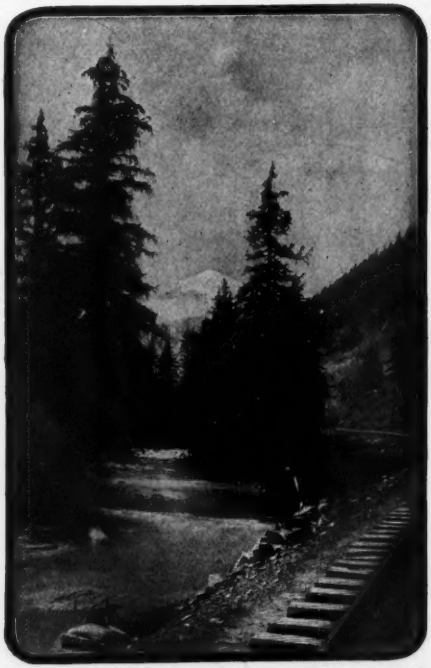

Scene in Eagle River Canyon along Denver & Rio Grande R. R.

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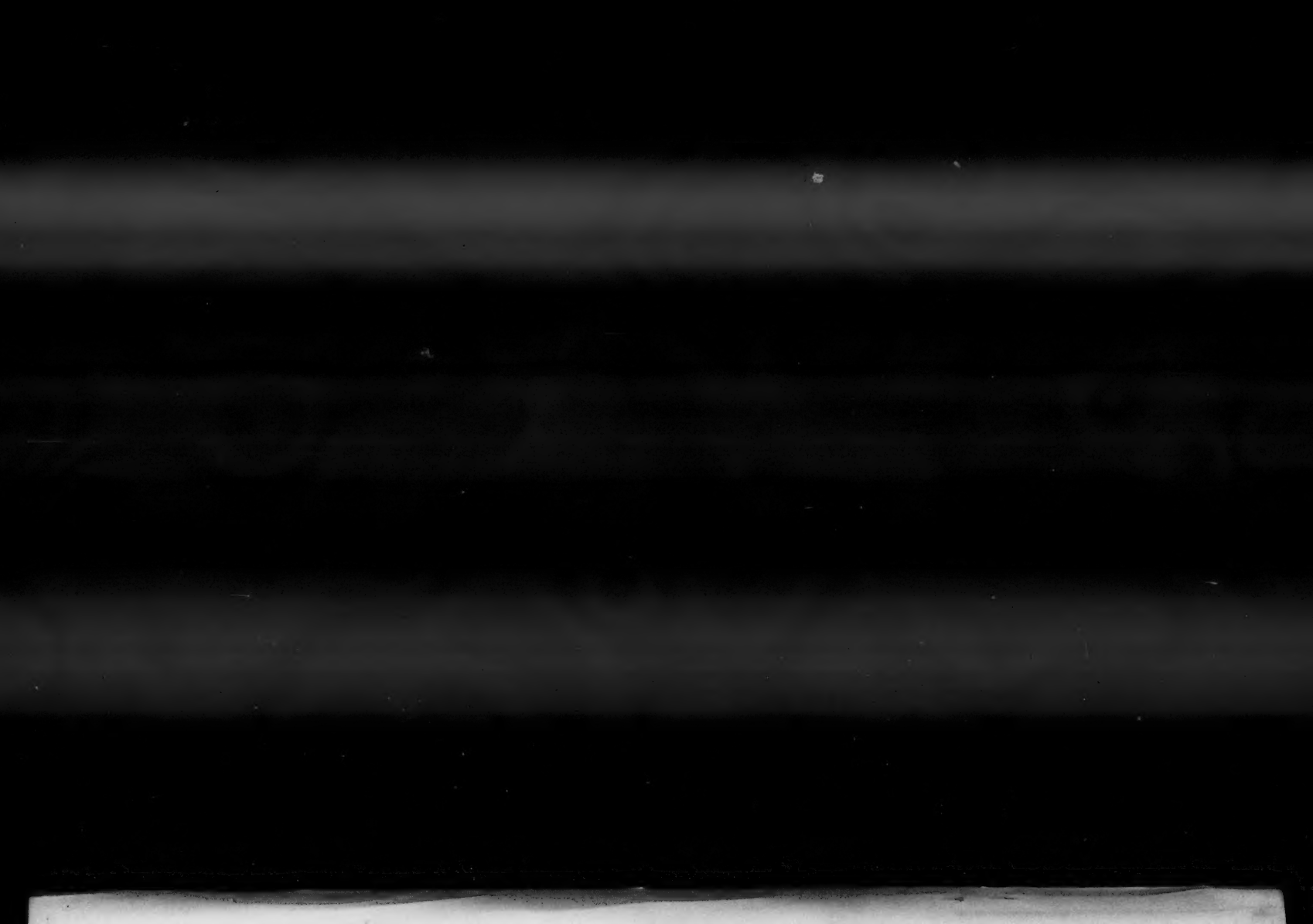
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